

S
628.168 McGuire, Daniel L
E30cfrm Clark Fork River
1998 macroinvertebrate
community
biointegrity

STATE DOCUMENTS COLLECTION

PLEASE RETURN

RECEIVED 1998

MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59620

**CLARK FORK RIVER
MACROINVERTEBRATE COMMUNITY BIOINTEGRITY:
1996 ASSESSMENT**

prepared for
Montana Department of Environmental Quality
Planning, Prevention and Assistance Division

prepared by
Daniel L. McGuire
McGuire Consulting

June, 1998

JAN 9 2002

FEB 12 2002



SUMMARY

The Montana Department of Environmental Quality has conducted annual macroinvertebrate surveys in the Clark Fork River Basin since 1986. Each August, we assess biological integrity to evaluate water quality at 25 sites from the headwaters to Thompson Falls Reservoir. Our analysis was developed specifically for the Clark Fork River drainage and compares each station to a fixed reference condition. The analysis integrates ten measures of macroinvertebrate structure and function into a single index of biological integrity. In addition, subsets of indices sensitive to metals pollution or to nutrient and organic pollution estimate the relative severity of these pollutants. Analyses of metals-sensitive indicator taxa population data supplemented the community-based assessment. In this report, the 1996 data are presented and analyzed. A detailed picture of environmental health and water quality trends in the Clark Fork Basin over the past 11 years is presented.

Since 1986, the biological integrity of macroinvertebrate assemblages has reflected a wide range of environmental conditions and water quality in the Clark Fork River drainage. On a scale of 0 to 100% (with values greater than 90% indicating nonimpairment), biointegrity ranged from 13 to 98% within the study area. A consistent pattern of impairment existed during the first seven years of monitoring. Biointegrity was lowest in Silver Bow Creek. Benthic assemblages were moderately impaired in the upper Clark Fork River, but were much healthier than in Silver Bow Creek. Biological condition improved from the Clark Fork's headwaters downstream to Turah. This pattern was interrupted by slight declines in biointegrity from Deer Lodge to the Little Blackfoot River and again from Bearmouth to Bonita. Downstream from Missoula, the Clark Fork River was slightly impaired.

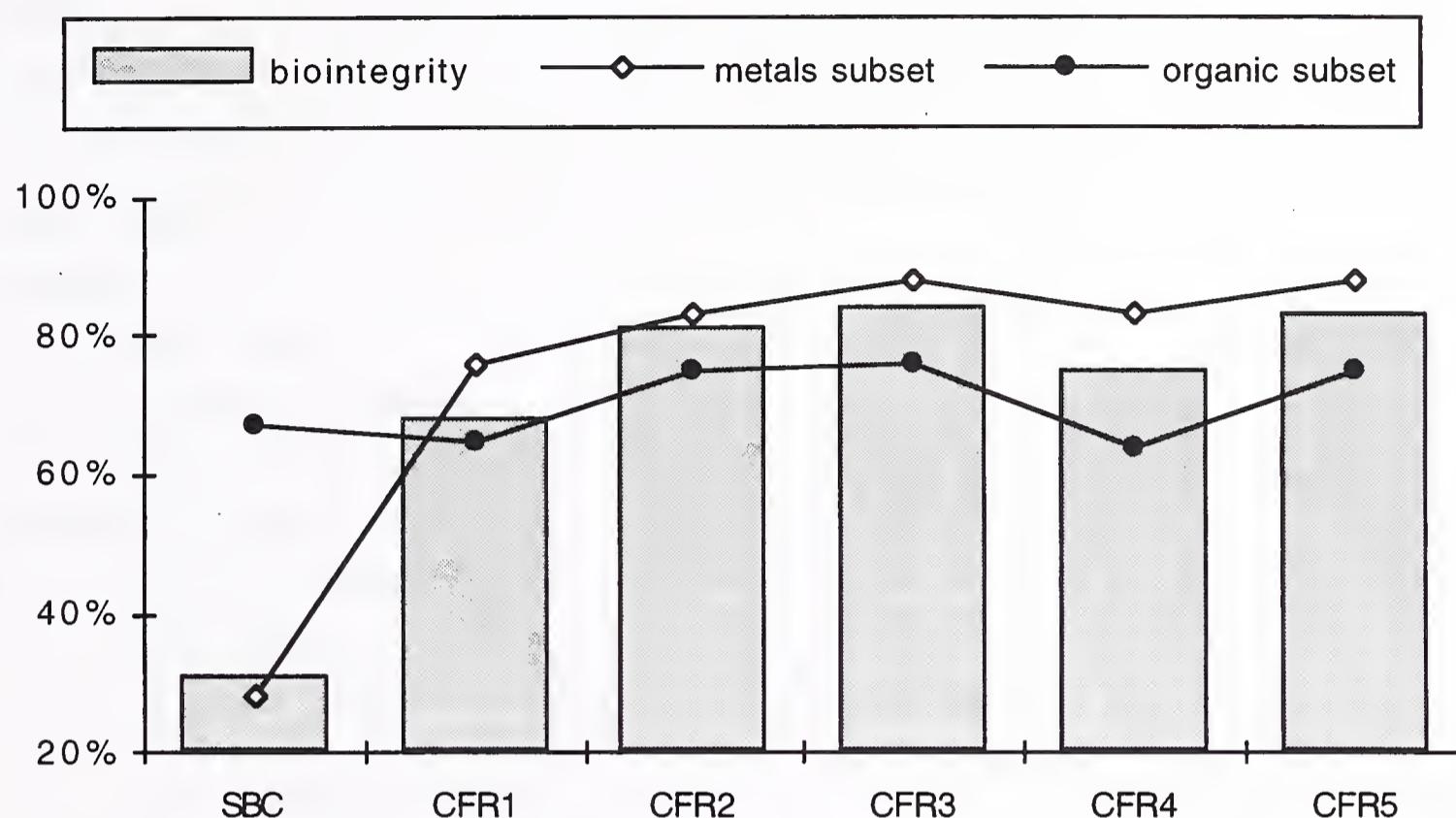
Metals pollution was severe in Silver Bow Creek and was usually detectable in the Clark Fork River as far as the confluence of the Little Blackfoot River. The upper Clark Fork River typically experienced slight metals-related impacts. Metals pollution was occasionally indicated as far downstream as Missoula. Nutrient and organic pollution suppressed biointegrity slightly throughout the Clark Fork mainstem and in the lower Bitterroot River and Flint Creek. Increased nutrient/organic pollution was evident in the Clark Fork from the confluence of the Bitterroot River to Huson. Impacts in this reach were attributed to nutrients from the Missoula WWTP, the Bitterroot River, and the Stone Container kraft mill. Organic/nutrient pollution was also evident in Silver Bow Creek below the Butte municipal wastewater outfall. High biointegrity scores indicated excellent water quality in the Little Blackfoot River, Rock Creek and the Blackfoot River.

Since 1993, biological integrity has improved at seven stations in the upper basin. Significant trends were evident in Silver Bow Creek, Warm Springs Creek, Blackfoot River, and in the Clark Fork River immediately downstream from confluences of Warm Springs Creek, the Little Blackfoot River and Rock Creek. Improved biointegrity was primarily attributable to a slight, but widespread reduction in metals pollution. Trend analyses of metals-sensitive metrics scores indicated diminished metals pollution in portions of Silver Bow Creek, in Warm Springs Creek, and at eight Clark Fork River stations. Improved community biointegrity coincided with increased abundance of metals-intolerant taxa in Warm Springs Creek and in the Clark Fork River immediately below Warm Springs, at the Gold Creek Bridge and at Turah. However, indicator taxa remained rare at other sites in the upper Clark Fork River.

The greatest improvements in biointegrity occurred in Silver Bow Creek below the Warm Springs Ponds and in the Clark Fork River below Warm Springs Creek. Remediation activities at the Warm Springs Ponds and in the Mill-Willow creeks bypass channel coincided with improved biointegrity in this reach. The biological health of the upper Clark Fork River was also enhanced by generally higher summer stream flows since 1993. Biointegrity was highest at all Clark Fork River stations from Deer Lodge to the confluence of the Bitterroot River in 1993. The highest biointegrity recorded in the Clark Fork River below Warm Springs Creek occurred in 1995. Although biointegrity remained impaired, scores have been above the 11-year average at most stations since 1993. Since 1993, the longitudinal pattern has indicated declining biointegrity in the Clark Fork River between Warm Springs Creek and Deer Lodge.

In 1996, biointegrity was impaired at 20 of 25 monitoring stations. Warm Springs Creek, Little Blackfoot River, Rock Creek and the Blackfoot River were nonimpaired in 1996. The Clark Fork at Turah was the only nonimpaired mainstem station in 1996. Metals pollution resulted in severe biological impairment in upper Silver Bow Creek. Silver Bow Creek below the Warm Springs Ponds and the Clark Fork River from Deer Lodge to the Little Blackfoot River were moderately impaired by nutrient/organic pollution. Slight metals impacts were also evident below the Warm Springs Ponds and at Deer Lodge. Nutrient and organic pollution appeared to be the principal causes of slight biological impairment in the remainder of the Clark Fork River. Ice scour and sediment transport during the spring of 1996 had a negative affect on biointegrity in the Clark Fork River downstream from Missoula.

Longitudinal trends - Mean biointegrity (%) of stream reaches in the Clark Fork River Basin during August, 1986 through 1996. Metals and organic scores are based on metrics considered most sensitive to each type of pollution.



Stream reaches: SBC = Silver Bow Creek, CFR1 = Clark Fork River from Warm Springs Creek to the Little Blackfoot River, CFR2 = Clark Fork River from the Little Blackfoot River to Turah, CFR3 = Clark Fork River from the Blackfoot River to the Bitterroot River, CFR4 = the Clark Fork River from the Bitterroot River to Alberton, CFR5 = Clark Fork River from Alberton to the Flathead River.

Temporal trends -Mean sequential biointegrity (%) in the Clark Fork River Basin during 11 years of monitoring (20 stations, 80 samples per year).

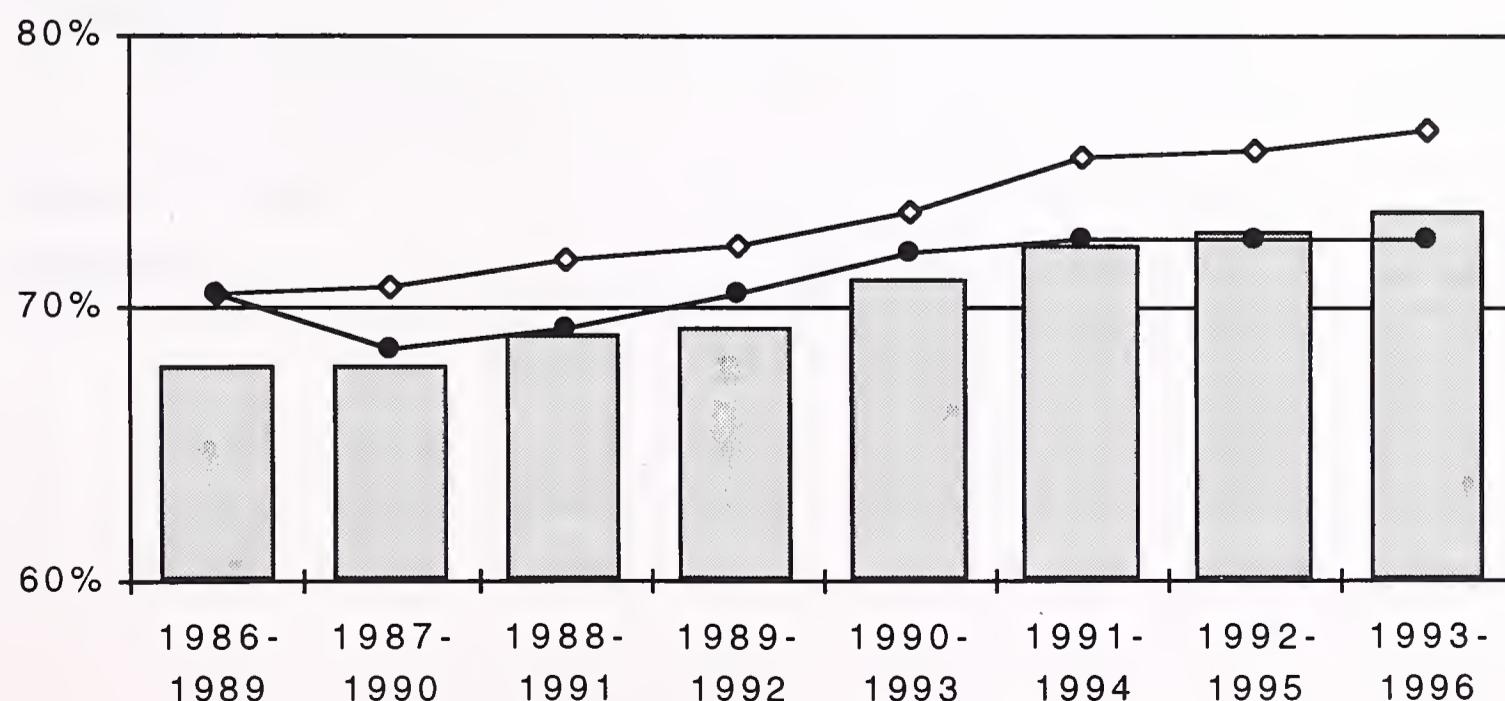


TABLE OF CONTENTS

	page
SUMMARY	i
LIST OF FIGURES	v
LIST OF TABLES	vii
LIST OF APPENDICES	vii
1 INTRODUCTION	1
2 STUDY AREA	2
3 METHODS	5
3.1 Field Work	5
3.2 Laboratory Analysis	5
3.3 Data Analysis	5
4 RESULTS AND DISCUSSION	16
4.1 Stream Discharge	16
4.2 1996 Results	16
4.2.1 Community Composition and Structure	16
4.2.2 1996 Community Biointegrity	17
4.2.3 Metals Pollution	18
4.2.4 Nutrient and Organic Pollution	19
4.3 Site Specific Assessments	19
4.3.1 Clark Fork Basin Tributaries	19
4.3.2 Clark Fork River	23
4.4 Trend Monitoring	28
4.4.1 Longitudinal Trends	28
4.4.2 Temporal Trends	29
4.5 Indicator Taxa	30
5 CONCLUSIONS	61
5.1 1996 Monitoring	61
5.2 Long-term Monitoring	62
6 LITERATURE CITED	64
7 APPENDICES	68

LIST OF FIGURES

Figure		page
1	Clark Fork Basin Monitoring Project - 1996 macroinvertebrate stations.	3
2	Mean biointegrity in Clark Fork River Basin reaches during 1996.	40
3	Benthic community biointegrity at 25 stations in the Clark Fork River Basin during 1996.	41
4	Long-term mean biointegrity in selected Clark Fork River tributaries.	42
5	Biointegrity (%) in Blacktail Creek above Grove Gulch (station SF-1), 1993-1996.	43
6	Biointegrity (%) in Silver Bow Creek above the Butte WWTP (station 00), 1987-1996.	43
7	Biointegrity (%) in Silver Bow Creek below the Colorado Tailings (station 01), 1986-1996.	44
8	Biointegrity (%) in Silver Bow Creek near Opportunity (station 02.5, 1993-1996; station 0.3, 1986-1992).	44
9	Biointegrity (%) in Silver Bow Creek below the Warm Springs Ponds (station 04, 1986-1991; station 04.5, 1993-1996).	45
10	Biointegrity (%) in Warm Springs Creek near mouth (station 06), 1986-1996.	45
11	Biointegrity (%) in the Little Blackfoot River near mouth (station 10.2), 1993-1996.	46
12	Biointegrity (%) in Flint Creek at New Chicago (station 11.5), 1993-1996.	46
15	Biointegrity (%) in Rock Creek near mouth (station 12.5), 1993-1996.	47
14	Biointegrity (%) in the Blackfoot River near mouth (station 14), 1986-1996.	47
15	Biointegrity (%) in the Bitterroot River near mouth (station 19), 1986-1996.	48
16	Mean biointegrity at 19 mainstem stations in the Clark Fork River Basin, 1986-1996.	49

A faint, horizontal watermark-like image of a stack of books is visible across the entire page.

Digitized by the Internet Archive
in 2015

<https://archive.org/details/clarkforkriverma1998mcgu>

LIST OF FIGURES (continued)

Figure		page
17	Biointegrity (%) in the Clark Fork River below Warm Springs Creek (station 07), 1986-1996.	50
18	Biointegrity (%) in the Clark Fork River at Deer Lodge: (station 09), 1986-1996.	50
19	Biointegrity (%) in the Clark Fork River above the Little Blackfoot River (station 10), 1986-1996.	51
20	Biointegrity (%) in the Clark Fork River at Gold Creek Bridge (station 11), 1986-1996.	51
21	Biointegrity (%) in the Clark Fork River at Bearmouth (station 11.7), 1993-1996.	52
22	Biointegrity (%) in the Clark Fork River at Bonita (station 12), 1986-1996.	52
23	Biointegrity (%) in the Clark Fork River at Turah (station 13), 1986-1996.	53
24	Biointegrity (%) in the Clark Fork River above Missoula (station 15.5), 1989-1996.	53
25	Biointegrity (%) in the Clark Fork River at Shuffield's (station 18), 1986-1996.	54
26	Biointegrity (%) in the Clark Fork River at Harper Bridge (station 20), 1986-1996.	54
27	Biointegrity (%) in the Clark Fork River at Huson (station 22), 1986-1996.	55
28	Biointegrity (%) in the Clark Fork River at Superior (station 24), 1986-1996.	55
29	Biointegrity (%) in the Clark Fork River above the Flathead River (station 25), 1986-1996.	56
30	Biointegrity (%) in the Clark Fork River above Thompson Falls Reservoir (station 27), 1987-1995.	56
31	Mean biointegrity at 17 stations in the Clark Fork River Basin, 1986-1996.	57
32	Density and frequency of occurrence of Tanytarsini midges at Clark Fork River monitoring stations (1986-1996).	58

LIST OF FIGURES (concluded)

Figure		page
33	Density and frequency of occurrence of <i>Arctopsyche grandis</i> at Clark Fork River monitoring stations (1986-1996).	58
34	Density and frequency of occurrence of <i>Hesperoperla pacifica</i> at Clark Fork River monitoring stations (1986-1996).	59
35	Density and frequency of occurrence of <i>Claassinia sabulosa</i> at Clark Fork River monitoring stations (1986-1996).	59
36	Density and frequency of occurrence of Heptageniidae mayflies at Clark Fork River monitoring stations (1986-1996).	60

LIST OF TABLES

<u>Table</u>		<u>page</u>
1	Clark Fork Basin Project - biomonitoring stations.	4
2	Metrics and scoring criteria used to determine biological integrity in the Clark Fork River Basin.	15
3	Mean streamflows during August at selected USGS gaging stations in the Clark Fork River Basin.	33
4	Mean metric values characterizing macroinvertebrate assemblages in six reaches of the Clark Fork River basin during August, 1986 through 1996.	34
5	Macroinvertebrate community biointegrity estimates for Clark Fork River Basin stations during August, 1996.	35
6	Mean macroinvertebrate biointegrity (%) and Spearman rank correlation coefficients (rs) for long-term Clark Fork River Basin monitoring stations - August, 1986-1996.	36
7	Macroinvertebrate biointegrity (%) as measured by metrics sensitive to metals pollution and Spearman rank correlation coefficients (rs) for long-term Clark Fork River Basin monitoring stations - August, 1986-1996.	37
8	Macroinvertebrate biointegrity (%) as measured by metrics sensitive to organic pollution and Spearman rank correlation coefficients (rs) for long-term Clark Fork River Basin monitoring stations - August, 1986-1996.	38
9	Densities and frequency of occurrence of selected indicator taxa in the upper Clark Fork River, 1986-1996.	39

LIST OF APPENDICES

Appendix

A.	Macroinvertebrate checklist for the Clark Fork River Basin with biotic and metals tolerance values	A.1
B.	1996 Clark Fork Basin macroinvertebrate data	B.1
C.	Metric values and bioassessment scores for Clark Fork Basin monitoring stations, 1986-1996	C.1

1. INTRODUCTION

The Montana Department of Environmental Quality (DEQ) conducts annual macroinvertebrate surveys as part of a comprehensive environmental surveillance program of the Clark Fork River Basin. In 1986, the program expanded from a water quality study of the lower 230 miles of the Clark Fork River (Ingman 1985) into the headwaters of the Clark Fork Basin. Each August, macroinvertebrates have been collected at 25 stations along a 300-mile reach from Silver Bow Creek, in the headwaters, to Thompson Falls Reservoir on the lower Clark Fork River. This report documents the 11th year of monitoring in the upper Clark Fork River Basin.

Macroinvertebrates are good indicators of water quality and are commonly used to evaluate environmental impacts to streams. Healthy streams support diverse assemblages of mayflies (Ephemeroptera), stoneflies (Plecoptera), caddisflies (Trichoptera), true flies (Diptera), beetles (Coleoptera) and many others. These organisms provide energy pathways from primary producers (algae) and organic material to consumers (fish, humans, etc.). As integral components of stream ecosystems, macroinvertebrate assemblages reflect the cumulative impacts of all pollutants. Toxic substances, organic pollution and excessive sediment loading produce characteristic changes in the macroinvertebrate community. These responses can be used to document the type(s) and degree of pollution.

Macroinvertebrate-based assessments can be used to quantify ecosystem health or, its converse, environmental degradation. Biointegrity has been defined as "the capacity of supporting and maintaining a balanced, integrated, adaptive community having species composition diversity and functional organization comparable to that of natural habitat of the region" (Karr and Dudley 1981). This concept has

been refined to incorporate both ecological integrity and human values by Meyer (1997) who describes a healthy stream as "an ecosystem that is sustainable and resilient, maintaining its ecological structure and function over time while continuing to meet societal needs and expectations".

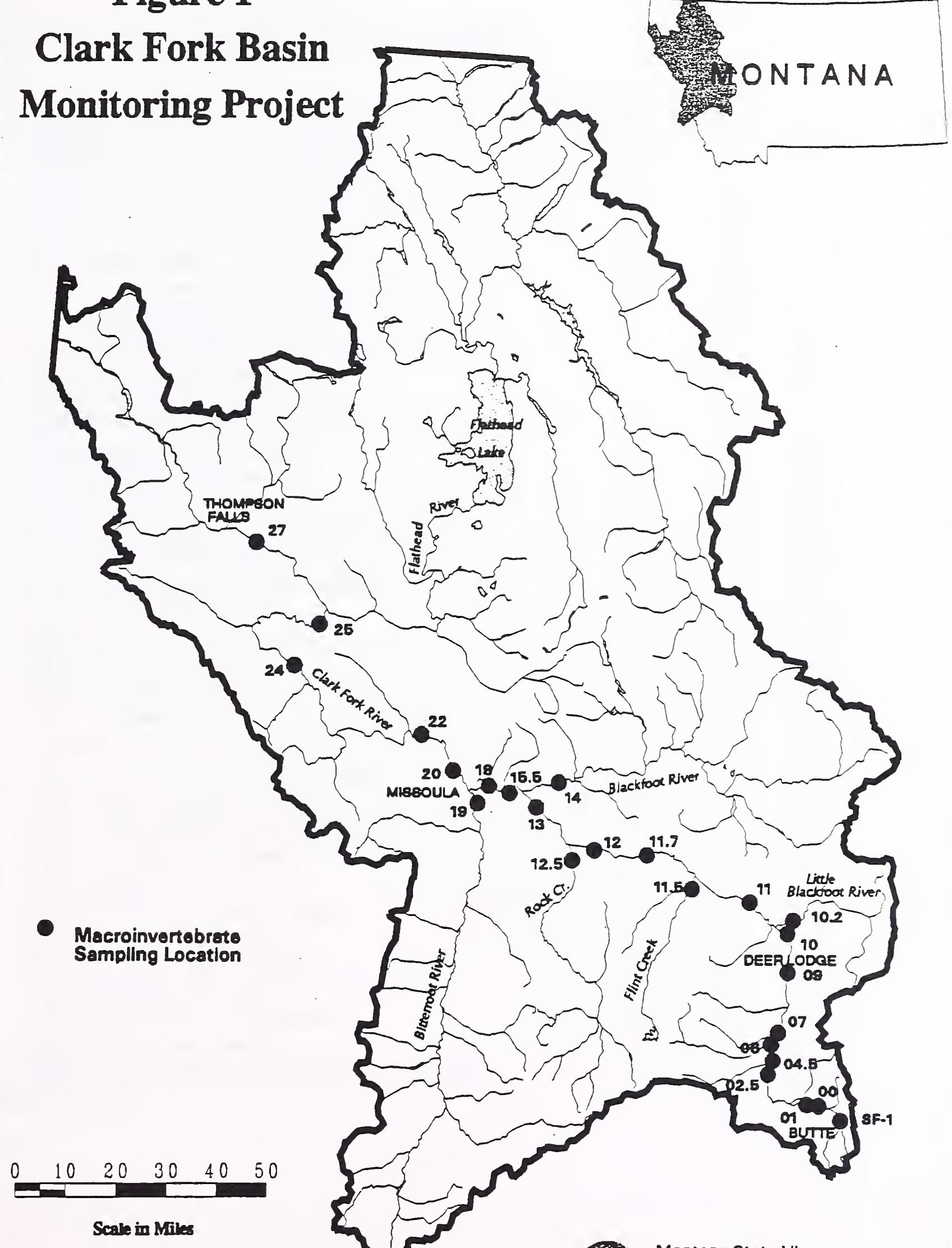
The analysis used in this report was specifically developed for the Clark Fork River Basin. Annual evaluations of aquatic ecosystem health are made at 25 sites and longitudinal and temporal trends are evaluated (McGuire 1987, 1989a, 1989b, 1993, 1995, 1997, McGuire and Ingman 1996). With the inclusion of the 1996 data, an 11-year data base exists for trend monitoring at 20 stations. The stations established in 1993 improve impact assessments for the upper basin and will eventually be incorporated into the temporal analyses.

2. STUDY AREA

The study area includes Silver Bow Creek, approximately 267 miles of the Clark Fork River and the lower reaches of eight tributaries (Figure 1). As in previous years, 25 stations were sampled in 1996 (Table 1). Sampling locations have remained unchanged since 1993 when seven sites were relocated. In 1993, five stations were dropped from the program (McGuire 1993) and stations were established on the Clark Fork at Bearmouth (station 11.7) and in the lower reaches of Blacktail Creek, the Little Blackfoot River, Flint Creek and Rock Creek (stations SF-1, 10.2, 11.5, and 12.5, respectively). Blacktail Creek is a head-water tributary to Silver Bow Creek while the other streams flow directly to the Clark Fork River. Due to construction in and around the Warm Springs Ponds, Silver Bow Creek stations 03 and 04 were replaced, respectively, by stations 02.5 and 04.5. Trend monitoring at these sites incorporates data from the original stations (1986-1992) and the replacement stations (1993-1996).

Figure 1

Clark Fork Basin Monitoring Project



Montana State Library
Natural Resource Information System
Map #96dhes59b - May 1, 1996

Table 1. Clark Fork Basin Project - biomonitoring stations.

station	name	reach	period of record
SF-1	Blacktail Creek above Grove Gulch		1993 - 1996
00	Silver Bow Creek above Butte WWTP	SBC	1987 - 1996
01	Silver Bow Creek below Colorado Tailings	SBC	1986 - 1996
02 *	Silver Bow Creek near Ramsay	SBC	1986 - 1992
02.5	Silver Bow Creek at Opportunity	SBC	1993 - 1996
03 *	Silver Bow Creek above Warm Springs Ponds	SBC	1986 - 1992
04 *	Warm Springs Pond #2 discharge		1986 - 1991
04.5	Silver Bow Creek below Warm Springs Ponds		1993 - 1996
05 *	Mill-Willow Creeks bypass at mouth		1986 - 1991
06	Warm Springs Creek near mouth		1986 - 1996
07	Clark Fork River below Warm Springs Creek	CF1	1986 - 1996
08 *	Clark Fork River near Dempsey	CF1	1986 - 1992
08.5 *	Clark Fork River at Sager Lane	CF1	1990 - 1992
09	Clark Fork River at Deer Lodge	CF1	1986 - 1996
10	Clark Fork River above Little Blackfoot River	CF1	1986 - 1996
10.2	Little Blackfoot River near mouth		1993 - 1996
11	Clark Fork River at Gold Creek Bridge	CF2	1986 - 1996
11.5	Flint Creek at New Chicago		1993 - 1996
11.7	Clark Fork River at Bearmouth	CF2	1993 - 1996
12	Clark Fork River at Bonita	CF2	1986 - 1996
12.5	Rock Creek near Clinton		1993 - 1996
13	Clark Fork River at Turah	CF2	1986 - 1996
14	Blackfoot River near mouth		1986 - 1996
15 *	Clark Fork River below Milltown Dam	CF3	1986 - 1988
15.5	Clark Fork River above Missoula	CF3	1989 - 1996
16 *	Clark Fork River above Missoula WWTP	CF3	1986 - 1988
18	Clark Fork River at Shuffield's	CF3	1986 - 1996
19	Bitterroot River near mouth		1986 - 1996
20	Clark Fork River at Harper Bridge	CF4	1986 - 1996
22	Clark Fork River at Huson	CF4	1986 - 1996
23 *	Clark Fork River near Alberton	CF4	1986 - 1992
24	Clark Fork River at Superior	CF5	1986 - 1996
25	Clark Fork River above Flathead River	CF5	1986 - 1996
26 *	Flathead River near mouth		1986 - 1988
27	Clark Fork River above Thompson Falls Reservoir		1987 - 1996

* discontinued stations

3. METHODS

3.1 Field Work

Since 1986, WQD staff have collected benthic organisms with a modified Hess sampler (0.1 sq. meter diameter, 1000 micron mesh netting). During August of each year, four replicate samples were obtained from each station. Sampling methods are described in the WQD's Field Procedures Manual (1996). At each site, samples were obtained from the richest, most heterogeneous cobble habitats in riffles.

3.2 Laboratory Analysis

Laboratory processing was consistent with that used in previous years. Samples were rinsed in a U.S. Standard #30 sieve to remove the preservative. A small portion of the sample was placed in a white pan divided into ten equal areas by a grid. All macroinvertebrates were removed and sorted to order. This process was repeated until the entire sample was processed. If the sample clearly contained more than 1000 organisms, subsampling was used to estimate densities of selected abundant taxa (e.g. blackflies or hydropsychids). Samples were processed as usual except that selected taxa were removed from only two randomly selected grids. The number in the subsample was multiplied by five to provide estimated density per 0.1 m² Hess sample. Organisms were identified to the lowest level practical, usually genus or species, and enumerated.

3.3 Data Analysis

The analysis was specifically designed to evaluate environmental conditions in the Clark Fork River Basin (McGuire 1993). The analysis incorporates 10 metrics (Table 2) into a single index of biological integrity. The metrics used in the analysis exhibit predictable responses to environmental stress and were the most suitable to the broad range of

habitats within the study area. Each metric measured a different aspect of community composition, structure or function. Since biological communities integrate the effects of all environmental stresses, this analysis provided a reliable evaluation of cumulative impacts from metals, nutrients, habitat degradation, and streamflow alteration.

To evaluate stream health, each metric was assigned a score (0 to 6) based on its comparability to a reference value. Scores for all metrics were totaled and the sum, expressed as a percentage of the maximum possible score, was used as an estimate of biological integrity. The resulting summary score provides a reliable and easily understandable estimate of ecological health.

Metric scoring criteria reflect the range of values in the Clark Fork River Basin from 1986 through 1990. Data from the first three years (1986-1988) of the Clark Fork River Basin study and two years of data (1988-1989) from the Blackfoot River were used to establish metric scoring criteria. For each metric, statistically significant differences among stations were identified by one-way analysis of variance (McGuire 1987, 1989a 1989b, 1990a, 1990b, Ingman et al. 1989, and unpublished data). Scoring criteria endpoints were defined by statistically distinct groups of stations with the highest and lowest scores. Nonimpaired endpoints were based on stations with the best metric scores and were generally established as the mean minus one standard deviation. On the lower end of the scale, endpoints were generally based on average values of the most severely impaired station(s). The inclusion of Silver Bow Creek data resulted in wide scoring ranges for most metrics and, consequently, some statistical differences in metric values were not reflected in the scoring criteria.

Scoring criteria for some metrics were modified to improve the reliability of the assessment. The lower end of the scoring criteria for taxa richness was truncated to provide better discrimination of slight impacts in the Clark Fork River at the

expense of detecting slight improvements in Silver Bow Creek. Scoring criteria for percent filterers, Baetidae to Ephemeroptera, Hydropsychinae to Trichoptera, and EPT to EPTC ratio metrics were relaxed to improve the reliability of these metrics over the wide range geographic area.

The biointegrity assessment sacrifices some sensitivity to subtle differences to improve reliability. In general, biological integrity in the Clark Fork Basin can be categorized as nonimpaired (90 to 100%), slightly impaired (70 to 90%), moderately impaired (50 to 70%), or severely impaired (<50%). These impairment classifications were more conservative than statistical differences in the 1986 through 1988 Clark Fork River Basin data. Except for borderline values, scores in different narrative categories are considered significantly difference from one another.

Macroinvertebrate assemblages exhibit predictable responses to different types of environmental stress; consequently, the sensitivity of individual metrics varies with the type of pollution. Some parameters are useful as estimators of metals pollution while others are more sensitive to organic/nutrient enrichment, excessive sediment deposition or partial dewatering. Both metals and nutrient pollution are known to degrade water quality and impact aquatic life in the Clark Fork Basin (Ingman and Kerr 1990, McGuire 1990). Therefore, subsets of metrics considered sensitive to these forms of pollution were used to estimate the relative severity of each pollutant (Table 2).

Impacts attributable to metals and nutrient/organic pollutants were estimated by the sum of scores for metrics in each subset, expressed as a percentage of the maximum possible score (usually 18). Metrics comprising the nutrient/organic subset were community density, biotic index, and the percent relative abundance of filter-feeding macroinvertebrates. The subset used to estimate metals pollution consisted of community density, EPT richness and metals tolerance index.

A specific type of pollution was indicated when the score of one set of metrics was substantially lower than the other. To facilitate interpretation, impacts attributable to these pollutants were categorized as slight (~60 to 80%), moderate (~40 to 60%) or severe (< 40%). The more conservative classification scheme for these metric subsets reflects the limitations of an assessment based on only three metrics. The impairment classifications accurately reflect statistical differences in the 1986 through 1988 Clark Fork River Basin data. Except for borderline values, scores in different narrative categories were considered significantly difference from one another. Metrics and the rationale for their use are described below.

Macroinvertebrate Density

Total macroinvertebrate density is an important feature of community structure and, when carefully interpreted, can be a useful indicator of several different environmental conditions. Unusually high or low macroinvertebrate densities were considered indicative of environmental perturbation. Macroinvertebrate density tends to increase in response to organic and/or nutrient enrichment, and the magnitude of the increase reflects the magnitude of the pollution. Conversely, macroinvertebrate density may be reduced by toxic substances such as metals or by severe habitat degradation.

Low macroinvertebrate densities were used as an index of metals pollution in the upper Clark Fork River Basin. Specifically, this metric was included to document toxic impacts and to provide a measure of biological improvement in Silver Bow Creek. Historically, macroinvertebrates have been absent from or present at very low densities in Silver Bow Creek and the Mill-Willow Bypass (Spindler 1959, Multitech and OEA Research 1986, and McGuire 1990b). Increased macroinvertebrate abundance at these sites can

be considered a clear indication of reduced toxicity. This metric provides little information regarding environmental health in the remainder of the study area.

High macroinvertebrate standing crops were included as a metric to assess nutrient and organic loading in the Clark Fork River. Densities greater than 2,000 per sample (0.1 m^2) were attributed to organic pollution and/or enhanced primary production caused by nutrient enrichment. Given the threshold value of 2,000 organisms per sample, it is not considered a sensitive measure of organic loading in more oligotrophic tributaries. Because toxic conditions can preclude high macroinvertebrate densities (McGuire 1990b), this metric was not used to evaluate organic/nutrient pollution when density was less than 550 organism per sample. Densities between 550 and 2,000 organisms per sample received maximum scores for both metrics.

Taxa Richness

Taxa richness, or the number of macroinvertebrate taxa per Hess sample, was probably the single best measure of environmental condition in the Clark Fork River drainage. It is a reliable measure of biological integrity because the loss of the most sensitive species to any stress affects the index. The range for scoring this metric was 14 to 40 taxa per sample. This truncated scoring range maximizes the sensitivity of this metric to small reductions in taxa richness. Mean taxa richness in the lower Blackfoot River during 1988 and 1989 was 41 (Ingman et al 1990 and McGuire 1990a).

Shannon Diversity

Shannon diversity has long been used as an index of environmental condition (Weber 1973) and is a reliable measure of combined environmental stress in the Clark Fork drainage. This index has two components and is influenced by taxa richness and the distribution of individuals among

taxa (evenness). Reference stations had an average Shannon diversity value of 3.7 with a standard deviation of 0.4. For this analysis, values greater than 3.3 were considered nonimpaired.

EPT to Chironomidae Ratio (EPT/EPTC)

This metric, originally developed by the EPA (Plafkin et al. 1989), is based on relative abundance of indicator groups. Most Ephemeroptera, Plecoptera, and Trichoptera are considered sensitive to environmental stresses while Chironomidae, as a group, are more tolerant. In the form $(E+P+T) / (E+P+T+C)$, this metric ranges from 0 to 1.

An even distribution of individuals among the four groups reflects good biotic condition while a disproportionate number of chironomids indicates environmental stress. For the Clark Fork analysis, values <0.55 indicate impairment. Using this scale, the EPT/EPTC metric reliably identifies severe biological impairment but does not consistently separate slight, moderate and nonimpaired sites. In some cases, large populations of relatively tolerant EPT taxa (e.g. Baetidae, *Tricorythodes* or hydropsychids) result in high EPT/EPTC values. The % Baetidae of Ephemeroptera and % Hydropsychinae of Trichoptera metrics are included to identify slight to moderate impairment missed by the EPT/EPTC metric.

Percent Baetidae of Ephemeroptera

Members of the family Baetidae are among the most pollution-tolerant mayflies (Hubbard and Peters 1978). Slight to moderate environmental stress is indicated when baetids comprise most of the mayfly fauna. This metric ranges from 0 to 1 with high values (>0.85) indicating biological impairment. This metric received a default value of 1 when no mayflies were collected.

Percent Hydropsychinae of Trichoptera

The subfamily Hydropsychinae is, in general, more tolerant of pollution than most other caddisflies (Harris and Lawrence 1978). Environmental stress is indicated when most of the caddisflies in a sample are *Hydropsyche* and *Cheumatopsyche*. This metric is analogous to the Baetidae/Ephemeroptera metric and ranges from 0 to 1 with high values (>0.85) indicating biological impairment. When no caddisflies were collected, this metric received a default value of 1.

Biotic Index

The biotic index is based on the indicator organism approach to water quality assessment and was developed to measure organic pollution. The index is calculated: $\text{SUM } (\%RA_j * t_i)$, where $\%RA_j$ is the percent relative abundance of each taxon and t_i is the tolerance value of the taxon. This index is on a scale of 0 to 10 with higher values indicating more polluted conditions. Tolerance values used in this study (Appendix A) were taken from Hilsenhoff (1987) and McGuire (1992).

Percent Relative Abundance of Filter Feeders

The relative abundance of functional feeding groups can provide useful insights into energy transfer, food resources and organic loading in aquatic ecosystems. Filter feeding insects typically comprise a major component of the summer macroinvertebrate fauna in Montana rivers. Relative abundance greater than 50 percent indicate high seston (suspended organics) concentrations that are usually associated with organic/nutrient enrichment, extensive filamentous algae growth, or lake outflows. This metric is used as a measure of organic pollution in the Clark Fork River Basin. Functional classifications were based on Merritt and Cummins (1984).

EPT Richness

This metric summarizes species richness of Ephemeroptera, Plecoptera, and Trichoptera and was used as an indicator of metals pollution. The majority of mayfly, stonefly and caddisfly species are highly sensitive to pollution. With a few exceptions, species in these groups are among the first to be eliminated by metals toxicity (Wiederholm 1984, Clements 1991). EPT richness averaged 21 among Blackfoot River reference stations. The scoring criteria reflect the wide range of values found within the study area. While minimizing influences of pollutants other than toxins, the wide range reduces the sensitivity of this metric to subtle changes.

Metal Tolerance Index (MTI)

This metric quantifies changes in community composition attributable to metals pollution in the Clark Fork River Basin. The format and calculation are based on Hilsenhoff's biotic index, with tolerance values assigned to each taxon based on sensitivity to metals rather than organics. The index is calculated: $\text{SUM } (\%RA_j * t_j)$, where $\%RA_j$ is the percent relative abundance of each taxon and t_j is the tolerance value of the taxon. The theoretical scale of the index is 0 to 10 with higher values indicating communities more tolerant of metals pollution. MTI values for communities dominated by species intolerant of metals are less than 4 (i.e. Blackfoot River) while values for communities composed of only the most metals-tolerant species approach 10 (i.e. Silver Bow Creek). Small, but statistically significant differences in metric values are not reflected in assessment scores due to the wide criteria range necessitated by the inclusion of Silver Bow Creek data.

Metals tolerance values (Appendix A) for most taxa were developed from the 1987 and 1988 Clark Fork River Basin water quality (Ingman and Kerr 1989) and macroinvertebrate (McGuire 1987 and 1989a) data. Ingman and Kerr (1989) quantified metals pollution severity for each

station based on the frequency and magnitude of measured copper, zinc, cadmium, and lead concentrations exceeding EPA chronic or acute criteria for the protection of aquatic life. Stations were ranked by metals pollution severity (0.00 to 26.19). Macroinvertebrate taxa were ranked according to their relative abundance and distributions along this gradient. Abundant taxa (comprising at least five percent of the fauna at any station) were assigned a rank corresponding to the station where they attained their maximum relative abundance. For less abundant taxa, ranks corresponded to the midpoint of their distribution within the study area. Ranks were transformed to a scale of 0 to 10, rounded to the nearest integer, and used as metals tolerance values. Some tolerance values, particularly for infrequently collected taxa, were modified based on the author's interpretation of pertinent literature (Clements 1991, Clements et al. 1988, Rolin 1988, Wiederholm 1984, Winner et al. 1980, Yasuno et al. 1985, Lynch et al 1988, Leland et al 1989).

Stream Reaches

For some analyses, the study area was partitioned into six ecologically distinct stream reaches (McGuire 1989a). Reaches vary in length from approximately 10 to 70 miles and, since 1993, include two or four sampling stations (Table 1). These data were used to summarize environmental health in relatively homogeneous river reaches and to evaluate temporal and longitudinal trends using a scale of miles rather than individual sites.

Trend Analysis

Longitudinal and temporal trends in biological integrity within the Clark Fork River Basin were evaluated at several levels of resolution. Spearman rank correlation (Zar 1974) was used to identify temporal trends in biointegrity. Correlation coefficients (r_s) were calculated to identify temporal trends at individual stations, within stream

reaches, and for the study area as a whole. For most stations, analyses were based on 44 samples obtained over 11 years. The fixed reference for all stations and years facilitated this trend analysis.

Indicator taxa

The distribution and abundance of selected indicator taxa were evaluated to compliment the community-based assessment. Many macroinvertebrate populations appear to limited or excluded from portions of the upper Clark Fork Basin by metals pollution. These include numerous mayflies, caddisflies, stoneflies, dipterans, mollusks and crustaceans. Among these taxa, five taxa were used to illustrate common distribution and abundance patterns. This approach has seen limited use in the Clark Fork Basin (McGuire 1989b) because of infrequent sampling and low densities of potential indicator species in the areas of interest. However, with 11 years of data, subtle differences in metals pollution may be more easily seen in the distribution and abundance of sensitive taxa than by community-based assessments.

Table 2. Metrics and criteria used to determine biological integrity in the Clark Fork River Basin.

Metric	Scoring Criteria						
	6	5	4	3	2	1	0
General							
Taxa richness	>39	39-35	34-30	29-25	24-20	19-15	<15
Shannon diversity	>3.3	3.3-3.0	2.9-2.6	2.5-2.2	2.1-1.8	1.7-1.4	<1.4
EPT/EPTC	>.54	.54-.45	.44-.35	.34-.25	.24-.15	.14-.05	<.05
Hydropsychinae/Trichoptera	<.85	.85-.87	.88-.90	.91-.93	.94-.96	.97-.99	1.00
Baetidae/Ephemeroptera	<.85	.85-.87	.88-.90	.91-.93	.94-.96	.97-.99	1.00
Organic pollution subset							
Density	550-1999	2000-2599	2600-3199	3200-3799	3800-4399	4400-4999	>5000
Biotic index	<4.0	4.0-4.5	4.6-5.1	5.2-5.7	5.8-6.3	6.4-6.9	>6.9
% Filterer	<51%	51-55%	56-60%	61-65%	66-70%	71-75%	>75%
Metals pollution subset							
Density	>549	549-450	449-350	349-250	249-150	149-50	<50
EPT richness	>21	21-18	17-14	13-10	9-6	5-2	<2
Metals Tolerance Index	<4.0	4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9	>8.9

all values are per 0.1 m² Hess sample.

Each metric was scored from 0 (severe impact) to 6 (no impact).

Biointegrity was estimated as the sum of metric scores divided by the maximum possible score.

4. RESULTS AND DISCUSSION

Appendix A contains tolerance values for 193 macroinvertebrate taxa found in the study area since 1986. Identifications, organism counts, metric values and summary statistics for 1996 are presented in Appendix B. For each station, mean metric values, metric scores and percentage biointegrity assessments were calculated for each year that data were available (Appendix C).

4.1 Stream Discharge

The Clark Fork River drainage experienced a large and extended runoff in 1996. By August, stream discharge was about average in Silver Bow Creek and the upper Clark Fork River but remained well above average in the Clark Fork River below Missoula (Table 3). Mean August discharge was the highest recorded in the Clark Fork near Plains since the biomonitoring program began in 1986.

4.2 1996 Results

4.2.1 Community Composition and Structure

Community composition and structure were markedly different among headwater stations. The impoverished benthic assemblages in Silver Bow Creek were dominated by pollution tolerant taxa and characterized by low diversity and taxa richness (Table 4). Pollution tolerant Chironomidae dominated in Silver Bow Creek above the Butte WWTP (station 00) while blackflies and chironomids dominated below the Colorado Tailings (station 01). Mayflies and stoneflies were essentially absent from these sites. Hydropsychid caddisflies were numerically dominant in lower Silver Bow Creek and were extremely abundant below the Warm Springs Ponds (station 04.5). Benthic assemblages were more complex, diverse, and species rich throughout the remainder of the study area. Blacktail Creek (station SF-1) supported more taxa and a more

balanced community than any site in Silver Bow Creek. Other tributaries generally supported rather sparse, but diverse, macroinvertebrate assemblages typified by high EPT richness.

In 1996, macroinvertebrates were more abundant in the upper Clark Fork (CFR1) than in downstream reaches. Mean community density was well above average in the Deer Lodge valley (CFR1) but below average in the remainder of the Clark Fork River (Table 4). Community density was the lowest recorded in 11 years of monitoring in the Clark Fork River reach from the Bitterroot River to Alberton (CFR4).

Hydropsychid caddisflies were numerically dominant at all but one station on the Clark Fork mainstem. Blackflies were the most abundant macroinvertebrate in the Clark Fork above the Little Blackfoot River (station 10). Dipterans, mayflies, beetles, stoneflies and other caddisflies were significant members of benthic assemblages throughout the Clark Fork River.

4.2.2 1996 Community Biointegrity

Significant environmental degradation was evident in most of the study area in 1996. Biological integrity was impaired in all 6 stream reaches (Figure 2). Silver Bow Creek above the Warm Springs Ponds (SBC) was severely impaired while slight biological impairment was prevalent in all five reaches of the Clark Fork River.

Biointegrity was impaired at 20 of 25 monitoring sites (Figure 3). Bioassessment scores ranged from 27 to 95% (Table 5) and were categorized as nonimpaired (90 to 100%), slightly impaired (70 to 90%), moderately impaired (50 to 70%), or severely impaired (<50%). In 1996, five sites were nonimpaired, twelve were slightly impaired, five were moderately impaired and two stations were severely impaired.

Four of the five sites considered nonimpaired in 1996 have been classified as nonimpaired during each of the last four

years. Biological integrity has been nonimpaired on each date since 1993 in the Clark Fork at Turah (station 13) and in the lower reaches of the Little Blackfoot River, Rock Creek, and the Blackfoot River (stations 10.2, 12.5, and 14, respectively). Biointegrity also exceeded 90% in lower Warm Springs Creek (station 06) during 1996.

Moderate and severe impacts were restricted to the upper reaches of the Clark Fork River Basin in 1996. The two upstream stations in Silver Bow Creek (stations 00 and 01) were severely impaired. Biointegrity was moderately impaired in Silver Bow Creek at Opportunity and below the Warm Springs Ponds (stations 02.5 and 04.5), in Blacktail Creek (station SF-1), and in the Clark Fork River from Deer Lodge to the confluence of the Little Blackfoot River (stations 09 and 10). Flint Creek (station 11.5), the Bitterroot River (station 19), and ten Clark Fork River stations (Table 5) were slightly impaired.

4.2.3 Metals Pollution

In 1996, scores for metals-sensitive metrics ranged from 33 to 94% and indicated metals pollution at seven stations in the Clark Fork River Basin (Table 5). Metals pollution was most severe (Figure 3) in Silver Bow Creek above the Warm Springs Ponds (SBC: stations 00, 01 and 02.5). Scores for the metals-sensitive metric subset ranged from 33 to 44% at the three stations on upper Silver Bow Creek. Slight metals-related impacts were indicated in Silver Bow Creek below the Warm Springs Ponds (station 04.5), in Blacktail Creek (SF-1), and in the Clark Fork River at Deer Lodge and at Huson (stations 09 and 22). Scores for the metals-sensitive metric subset ranged from 67 to 78% at these sites. Metals pollution was not indicated at 17 stations with metals subset scores ranging from 83 to 94%.

4.2.4 Nutrient and Organic Pollution

The macroinvertebrate bioassessment indicated widespread organic and/or nutrient pollution in the Clark Fork River during 1996 (Figures 2 and 3). Scores for the metrics most sensitive to these pollutants ranged from 50 to 100% and indicated biological impairment at 20 stations (Table 5). The Clark Fork River at Turah (stations 13) and stations on Warm Springs Creek, Little Blackfoot River, Rock Creek, and the Blackfoot River were the only sites where nutrient/organic enrichment was not detected.

Nutrient/organic pollution appeared to be the primary cause of reduced biological integrity during 1996 in Silver Bow Creek below the Warm Springs Ponds (station 04.5) and in much of the Clark Fork mainstem. Moderate nutrient/organic pollution was detected in Silver Bow Creek below the Warm Springs Ponds and in the Clark Fork River from Deer Lodge to the Little Blackfoot River (stations 09 and 10). Slight impacts attributable to nutrient/organic pollutants were indicated at ten other Clark Fork River stations (Table 5) and at headwater stations in Blacktail Creek (SF-1) and in upper Silver Bow Creek (stations 00, 01 and 02.5).

4.3 Site Specific Assessments

4.3.1 Clark Fork Basin Tributaries

Community-based assessments provide an overview of relative conditions at 11 stations on eight Clark Fork River tributaries. At least four years of data were available for each site and most have been monitored since 1986 (Table 1).

The types and severity of pollutants varied substantially among streams (Figure 4). Excellent water quality was indicated in the Little Blackfoot River, Rock Creek and the Blackfoot River. In most years, Flint Creek and the Bitterroot River were slightly impaired by nutrient/organic pollution while Warm Springs

Creek was slightly impaired by metals pollution. Blacktail Creek was moderately impaired by a combination of metals and nutrient/organic pollution. Silver Bow Creek above the Warm Springs Ponds (stations 00, 01 and 02.5) was severely polluted by metals while slight metals pollution was evident below the ponds (station 04.5). Slight to moderate nutrient/organic pollution was also indicated throughout Silver Bow Creek.

4.3.1.1 Blacktail Creek (station SF-1)

Blacktail Creek above Grove Gulch has been monitored since 1993. Biointegrity was 65% in 1996 and has ranged from 64 to 74% during the 4-year monitoring period. Slight to moderate impacts occurred on all dates. Biological integrity was suppressed by the combined affects of poor habitat and water quality. Benthic habitat was limited due to sand scouring and embeddedness. Slight metals pollution was indicated all four years while nutrient/organic pollution was indicated each year except 1994 (Figure 5). Nevertheless, this site was much healthier than stations in Silver Bow Creek.

4.3.1.2 Silver Bow Creek above the Butte WWTP (station 00)

In 1996, biointegrity at the uppermost Silver Bow Creek site was estimated at 30% while the metals subset score was 33%. These scores indicate improved water quality at this site. While the magnitude of improvement was small (Figure 6), significant trends of decreased metals pollution and improved biointegrity have been documented since 1987 (Tables 6 and 7). However, upper Silver Bow Creek was severely polluted by metals on all dates and this site remains one of the most degraded in the drainage.

4.3.1.3 Silver Bow Creek below the Colorado Tailings (station 01)

Biointegrity remained severely depressed in Silver Bow Creek below the Colorado Tailing and the Butte WWTP. In 1996, biointegrity was 27% and was similar to the 11-year average of

24%. Biological impairment was attributable to the combined impacts of severe metals pollution (39%), slight nutrient and organic pollution (61%) and poor habitat. The severity of metals pollution may have suppressed most biological responses to nutrient/organic pollution at this site. More severe nutrient/organic pollution has been evident on dates when metals impacts appeared reduced (Figure 7).

4.3.1.4 Silver Bow Creek at Opportunity (station 02.5)

Silver Bow Creek at Opportunity was moderately impaired by metals pollution in 1996. Biointegrity was estimated at 50% while scores for the organic and metals subsets were 75 and 44%, respectively.

Data from stations 03 (discontinued after 1992) and 02.5 were used to evaluate temporal trends in lower Silver Bow Creek (Appendix C). Tenuous, but statistically significant trends of improved biointegrity and diminished metals impacts were found (Tables 6 and 7). This reach has been classified as severely impaired each year except 1994 and 1996 (Figure 8). Biointegrity has averaged 44% during the past 11 years.

4.3.1.5 Silver Bow Creek below the Warm Springs Ponds (station 04.5)

In 1996, biointegrity at station 04.5 was moderately impaired (62%). Based on 4 years of data, this site was moderately impaired (66%) by a combination of metals (69%) and nutrient/organic pollution (65%).

Concurrent with rehabilitation of the Warm Springs Ponds, this station was moved from the old pond outflow (station 04) to a new location (station 04.5) in 1993. The new site was further from the ponds and, unlike the old site, downstream from the confluence of Mill and Willow Creeks. Biointegrity has been significantly higher at the new station than at the old site (Figure 9). Biointegrity was severely

impaired in Silver Bow Creek below the ponds from 1986 to 1991, but improved to slightly or moderately impaired since 1993. The Warm Springs treatment pond greatly reduced the severity of metals pollution in Silver Bow Creek. Since 1993, biological integrity has been significantly higher (ANOVA, P = 0.001) in Silver Bow Creek below the ponds than at upstream stations.

4.3.1.6 Warm Springs Creek (station 06)

Biological integrity was nonimpaired in Warm Springs Creek during 1996. However, metals pollution has been indicated during most years. Metals impacts have diminished and biointegrity has increased during the past 11 years (Tables 6 and 7). Biointegrity was nonimpaired in 1991, 1994, and 1996 and only slight metals pollution has been detected since 1991 (Figure 10). Nutrient/organic pollution was not indicated in Warm Springs Creek. Low stream flow precluded quantitative sampling in 1992.

4.3.1.7 Little Blackfoot River (station 10.2)

Biological integrity has been nonimpaired, indicating excellent water quality in the Little Blackfoot River during all four years of monitoring. Mean biointegrity was 92% in 1996 (Figure 11).

4.3.1.8 Flint Creek (station 11.5)

Flint Creek at New Chicago was slightly impaired in 1996. Biointegrity was estimated at 85%. Nonpoint source nutrient and sediment pollution have been indicated on most dates (Figure 12). From 1993 to 1996, mean biointegrity was 84%. The nutrient/organic metric subset averaged 74%. Metals pollution was not indicated.

4.3.1.9 Rock Creek near Clinton (station 12.5)

Biological integrity was nonimpaired in Rock Creek on all four dates sampled (Figure 13). Biointegrity scores have averaged 93%, indicating excellent water quality.

4.3.1.10 Blackfoot River near mouth (station 14)

The site on the lower Blackfoot River continued to be among the healthiest stations in the study area. Biointegrity has averaged 89% over the last 10 years and has been rated as nonimpaired since 1991 (Figure 14). Slight impairment was detected from 1986 through 1989. The stresses causing this impairment have diminished and biological integrity has increased in the lower Blackfoot River.

4.3.1.11 Bitterroot River near mouth (station 19)

The lower Bitterroot River was slightly impaired in 1996. Nutrient/organic pollution has been indicated during nine of the past 11 years (Figure 15).

4.3.2 Clark Fork River

The current biomonitoring program includes 14 station on the Clark Fork River (Table 1). Data from three additional mainstem stations were collected prior to 1993 (McGuire 1993).

Biological integrity estimates (Figure 16) have been fairly consistent for most sites since 1986. Based on long-term averages, all Clark Fork River stations were classified as slightly impaired except Deer Lodge (station 09) which was moderately impaired (Table 6). Nutrient/organic pollution was widespread but usually caused only slight biological impacts. Metals pollution was occasionally detected as far downstream as Huson; however, in most years, impacts have been slight and confined the river reach above the confluence of the Little Blackfoot River. Stations in the Deer Lodge Valley (stations 07, 09, and

10) and at Bonita (station 12) had the lowest biointegrity in the Clark Fork River. Clark Fork River stations with the highest biointegrity typically included the Gold Creek Bridge site (station 11), from Rock Creek downstream to the confluence of the Bitterroot River (stations 13, 15.5 and 18) and from Superior to the confluence of the Flathead River (stations 24 and 25).

4.3.2.1 Clark Fork River below Warm Springs Creek (station 07)

The uppermost station on the Clark Fork River was slightly impaired in 1996. Biointegrity was estimated at 77%, well above the 11-year average score for this site. Biointegrity was moderately impaired from 1986 through 1992, but has been only slightly impaired since 1993 (Figure 17). Significant trends of increasing biological integrity (Table 6) and decreasing metals (Table 7) and nutrient/organic pollution (Table 8) occurred at this site. Metals pollution was not evident at this site in 1996 and has been indicated only once since 1993. Metals pollution was indicated on all dates prior to 1993.

4.3.2.2 Clark Fork River at Deer Lodge (station 09)

The Clark Fork River at Deer Lodge was classified as moderately impaired during 1996. Biointegrity was estimated at 55% due to moderate nutrient/organic pollution (39%) and slight metals pollution (78%). This site was classified as moderately impaired during 8 of the last 11 years and, with the exception of Silver Bow Creek, had the lowest mean biointegrity (64%) in the study area. Both nutrient/organic and metals pollution were consistently indicated at this site (Figure 18). On most dates, nutrient/organic pollution appeared to have the greater impact on biointegrity.

4.3.2.3 Clark Fork River above Little Blackfoot River (station 10)

The Clark Fork River above the Little Blackfoot River was moderately impaired by nutrient/organic pollution in 1996.

The biointegrity estimate for 1996 (65%) was lower than the 11-year average (72%). Although slight metals pollution was routinely indicated at this site during the preceding 10 years, metals-related impacts were not evident in 1996. Moderate nutrient/organic pollution has been evident at this site on four dates since 1986 (Figure 19).

4.3.2.4 Clark Fork River at Gold Creek Bridge (station 11)

This is usually one of the healthiest sites on the upper Clark Fork River. Biointegrity averaged 84% over the past 11 years and was nonimpaired in 1993 and 1994 (Figure 20). In 1996, biological integrity was slightly impaired (78%) by nutrient and organic pollution. Metals pollution has not been indicated at this site since 1992.

4.3.2.5 Clark Fork River at Bearmouth (station 11.7)

The Clark Fork River at Bearmouth has been monitored since 1993 and was slightly impaired (70%) by nutrient/organic pollution in 1996. Nutrient pollution was also clearly indicated in 1994 and 1995 (Figure 21). Significant metals pollution has not been indicated at this site.

4.3.2.6 Clark Fork River at Bonita (station 12)

Nutrient/organic pollution caused slight biological impairment at this site in 1996 and on most other dates. The biointegrity estimate for 1996 and the long-term average were 70%. The Clark Fork at Bonita was slightly to moderately impaired by nutrient/organic and metals pollution from 1986 through 1992. While nutrient pollution remains evident, metals pollution has not been indicated since 1992 (Figure 22).

4.3.2.7 Clark Fork River at Turah (station 13)

The Clark Fork at Turah has been nonimpaired since 1993 and is now among the healthiest stations in the study area.

Biointegrity has increased slightly as nutrient and metals pollution diminished during the monitoring program (Figure 23). Biointegrity was estimated at 94% in 1996 and has averaged 88% over the past 11 years. Slight metals pollution was indicated at this site in 1986 and 1990 while nutrient and organic pollution was indicated in 1987, 1988, 1990 and 1992.

4.3.2.8 Clark Fork River above Missoula (station 15.5)

This site, located approximately 1.5 miles below Milltown Dam, was slightly impaired by nutrient/organic pollution in 1996. Biointegrity was slightly higher in 1996 (85%) than the 8-year average (81%). Slight to moderate nutrient/organic pollution was usually evident at this site (Figure 24). Slight metals pollution was indicated at this site in 1989 and 1990.

4.3.2.9 Clark Fork River at Shuffield's (station 18)

The Clark Fork at Shuffield's was slightly impaired in 1996. Biointegrity in 1996 (86%) was the same as the 11-year average. Slight nutrient/organic pollution was sometimes indicated (Figure 25) at this site which is approximately two miles below the Missoula WWTP discharge. Metals pollution has not been indicated at this site since monitoring began in 1986.

4.3.2.10 Clark Fork River at Harper Bridge (station 20)

This site had the lowest long-term mean biointegrity (74%) among stations from Missoula to the Flathead River. Biointegrity was slightly impaired (76%) in 1996. Nutrient/organic pollution has been indicated at Harper Bridge throughout the 11-year monitoring period. Impacts have generally been slight, although moderate impacts were indicated in 1988 and 1993 (Figure 26). Impacts appear to result from the assimilation of nutrients from the Missoula WWTP and the Bitterroot River.

4.3.2.11 Clark Fork River at Huson (station 22)

The 1996 biointegrity estimate (75%) and the nutrient/organic pollution subset score (67%) were similar to the long-term averages for the Clark Fork River at Huson. Slight impairment from nutrient/organic pollution has been evident throughout the monitoring period (Figure 27). Biointegrity was moderately impaired in 1986, 1988, and 1994 and slightly impaired on all other dates.

The 1996 data also suggested slight impacts from metals in this reach. The cumulative score for the metals subset (78%) was the lowest recorded for this station. However, extensive scour and deposition earlier in the year may have influenced this assessment. Due to significant changes in the stream channel, samples had to be collected at a different location (Shaffer Ranch) than in previous years. These factors may have contributed to the relatively low density and EPT richness values at this site in 1996. The metals tolerance index value (4.7) was considerably lower than at all other sites where metals impacts were indicated.

4.3.2.12 Clark Fork River near Superior (station 24)

The 1996 biointegrity estimate (73%) was the lowest recorded at this site since monitoring began (Figure 28). The relatively low biointegrity score may reflect stresses associated with high flows in the lower Clark Fork during the spring and summer of 1996. Additionally, a major chlorine spill occurred approximately 35 river miles upstream from this site during the spring of 1996.

Typically, this was one of the healthiest sites on the Clark Fork River. Biointegrity has averaged 83% during the past 11 years with slight nutrient/organic pollution indicated from 1987 through 1990, 1994 and 1996.

4.3.2.13 Clark Fork River above the Flathead River (station 25)

The Clark Fork River above the confluence of the Flathead River also had a relatively low biointegrity score in 1996. The biointegrity estimate for 1996 (77%) was the lowest recorded at this site since 1989 (Figure 29). Since 1986, biointegrity has averaged 83% at this site. Slight nutrient/organic pollution was indicated at this site on about 50 percent of the dates sampled.

4.3.2.14 Clark Fork River above Thompson Falls Reservoir (station 27)

Exceptionally high stream flows and scarce riffle habitat made sampling in 1996 more difficult than usual at this site. As a consequence, insufficient organisms were collected for a meaningful bioassessment. Less than 30 macroinvertebrates, mostly semiaquatic earthworms, were present in three of the four samples collected (Appendix B). Biointegrity scores averaged 69% at this site during the previous nine years (Figure 30).

4.4. Trend Monitoring

Longitudinal and temporal trends in biological integrity within the Clark Fork River Basin were evaluated at several levels of resolution.

4.4.1 Longitudinal Trends in Biointegrity

On a broad scale, longitudinal trends have been consistent since monitoring began in 1986. Among stream reaches (Summary Figure 1), biological integrity was lowest in Silver Bow Creek (SBC) and improved with distance downstream to the confluence of the Bitterroot River. The upper reach of the Clark Fork River (CFR1) was moderately impaired while downstream reaches (CFR2 through 5) were slightly impaired. Biointegrity was slightly lower in the Clark Fork River from the confluence

of the Bitterroot River to Alberton (CFR4) than in adjacent Clark Fork River reaches.

Long-term data from 17 mainstem stations provided a more detailed longitudinal pattern (Figure 16). Pollution was severe, and biointegrity was consistently lowest, at the two upstream stations in Silver Bow Creek (00 and 01). Biological integrity generally improved with distance downstream from these sites in lower Silver Bow Creek (stations 02.5 and 04.5) and the upper Clark Fork River.

Based on 11-year means, biointegrity in the Clark Fork mainstem was lowest from the confluence of Warm Springs Creek (station 07) to Deer Lodge (station 09) and increased in a downstream direction as far as the Gold Creek Bridge (station 11). Biointegrity was slightly impaired at all mainstem stations below the confluence of the Little Blackfoot River (Figure 31). The Clark Fork River stations with the highest biointegrity typically included the Gold Creek Bridge site (station 11), sites from Rock Creek downstream to the confluence of the Bitterroot River (stations 13, 15.5 and 18) and from Superior to the confluence of the Flathead River (stations 24 and 25). Biointegrity tended to be lower from Bearmouth to Bonita (stations 11.7 and 12) and from Harper Bridge to Alberton below Missoula (stations 20 and 22) than at adjacent stations.

4.4.2 Temporal trends

There has been one significant temporal change in the longitudinal pattern described above. Biointegrity has improved significantly since 1993 at station 07, the uppermost Clark Fork River site (Figure 17). In recent years, biointegrity has declined sharply in the Clark Fork River between this site and Deer Lodge (station 09).

Biointegrity has generally increased at monitoring stations in the Clark Fork Basin since 1986. Correlation coefficients (r_s) were positive for 19 of 20 long-term stations, all six stream

reaches, and the study area as a whole (Table 6). Trends were significant ($P = 0.05$) for seven sites in the upper basin. During the past 11 years, biological integrity has improved at three stations in Silver Bow Creek (00, 02.5 and 04.5), in lower Warm Springs Creek (station 06), the lower Blackfoot River (station 14) and in the Clark Fork River below Warm Springs Creek, and at Turah (stations 07 and 13, respectively).

Improved biointegrity at these stations was primarily attributable to a slight, but widespread reduction in metals pollution. Trend analyses of scores for metals-sensitive metrics indicated diminished metals pollution (P values < 0.05) during the monitoring period at 13 stations, in four stream reaches, and for the study area as a whole (Table 7). A significant negative trend was found at one station. The downward trend in the metals subset scores at Huson (station 22) was primarily due to an unusually low score in 1996. The actual change in scores over time was small in all cases.

Fewer trends were identified among scores for nutrient and organic-sensitive metrics. Trends indicating reduced nutrient/organic pollution were detected in the Clark Fork River below Warms Spring Creek (station 07) and at Turah (station 13).

4.5 Indicator taxa

Monitoring populations of indicator organisms is an appropriate technique for evaluating biological impacts of metals and is included to suppliment the community-based assessment. Differences in the abundance and occurrence of metals sensitive taxa can be used as measures of subtle changes in metals pollution over time and distance. Furthermore, analyses using the most susceptible taxa should provide more sensitive measures of low level pollution than community-based assessments. Examples of taxa that appear to be limited by metals pollution in the upper Clark Fork River Basin include

Heptageniidae mayflies, Tanytarsini midges, the caddisfly, *Arctopsyche grandis*, and the stoneflies, *Claassinia sabulosa* and *Hesperoperla pacifica* (Figures 32 through 36, respectively). Numerous other mayflies, caddisflies, stoneflies, dipterans, mollusks and crustaceans exhibit similar patterns of distribution and abundance in the upper Clark Fork River Basin.

All five indicator taxa were widely distributed within the study area and were more abundant in the Clark Fork River below Rock Creek and in tributaries than in the upper Clark Fork River (Figures 32 through 36). Reduced abundance and occurrence of susceptible taxa indicated varying levels of metals pollution in the upper Clark Fork River Basin. None of these taxa were present in Silver Bow Creek but each occurred infrequently in the Clark Fork River as it passed through the Deer Lodge Valley (stations 7 through 10). Densities and occurrences increased sharply below the confluence of the Little Blackfoot River; however, Heptageniidae, Tanytarsini and *Arctopsyche* populations remained suppressed at least as far downstream as Rock Creek (stations 11, 11.7 and 12). Heptageniid mayflies, among the most sensitive aquatic insects to metals (Clements et al. 1988, Wiederholm 1984), appeared to be slightly depressed from Rock Creek to below Milltown Dam (stations 13 and 15.5).

Demographic changes in indicator taxa populations corroborate the community-based assessment and confirm reduced metals pollution at some stations in the upper Clark Fork River during the 11-year monitoring period (Table 9). The most dramatic increases in indicator populations occurred in Warm Springs Creek (station 6) and at Clark Fork River stations below Warm Springs Creek, at the Gold Creek Bridge, and at Turah (stations 7, 11 and 13). Indicator taxa populations at Turah have been comparable to those in nonimpaired downstream reaches and tributaries since 1993.

As with the community-based assessment, indications of reduced metals pollution in the Clark Fork River at Deer Lodge, above the Little Blackfoot River and at Bonita (stations 09, 10 and 12, respectively) were less conclusive. However, there have been slight increases in the frequency of occurrence of *Tanytarsini* and perlid stoneflies at Deer Lodge and above the Little Blackfoot River in recent years. Also, 1996 was the first year in which *Arctopsyche* were collected (in low numbers) from all stations in the Deer Lodge Valley. It seems likely that *Hesperoperla* and *Arctopsyche* were limited by the combined effects of metals and relatively high summer water temperatures in this reach. *Claassinia*, which usually replaces *Hesperoperla* as the dominant perlid stonefly in warmer reaches of most Montana streams, remained essentially absent from the Clark Fork River above the confluence of the Little Blackfoot River. The absence or rarity of these metals-intolerant taxa indicate continued impacts from metals in the Clark Fork as it flows through the lower Deer Lodge Valley.

Table 3. Mean streamflows during August at selected USGS gaging stations in the Clark Fork River Basin (cubic feet per second).

year	Silver Bow Creek blw Blacktail Cr. USGS # 12323250	Clark Fork River at Deer Lodge USGS # 12324200	Clark Fork River below Missoula USGS # 12353000	Clark Fork River near Plains USGS # 12389000
1986	19.5	55.7	1812	7612
1987	27.7	88.5	1473	9813
1988	18.7	27.8	997	5656
1989	22.0	81.7	2464	14750
1990	25.8	84.3	2554	10510
1991	16.4	30.1	1997	10350
1992	14.2	40.1	1280	9738
1993	28.7	312	3696	11770
1994	16.1	36.3	1295	5891
1995	21.8	107	2561	10360
1996	18.7	95.2	2766	16530
mean	20.9	87	2081	10271
high and low flows in bold				

Table 4. Mean metric values characterizing macroinvertebrate assemblages in six reaches of the Clark Fork River Basin during August, 1986 through 1996 (ranges in parentheses).

metric	SBC		CFR1		CFR2		CFR3		CFR4		CFR5	
	1986-1995	1996	1986-1995	1996	1986-1995	1996	1986-1995	1996	1986-1995	1996	1986-1995	1996
Density	477 (88-1103)	759 (650-2769)	1796 (581-4704)	2712 (24-32)	1890 (26-40)	1223 (28-45)	1073 (616-2041)	751 (28-40)	2017 (839-3733)	679 (28-40)	1110 (393-2418)	806
Taxa richness	10 (7-12)	13 (10-15)	27 (13)	35 (19)	34 (18)	36 (19)	39 (20)	33 (24)	30 (17)	34 (17)	33 (19)	33
EPT richness	2 (1-3)	2 (10-15)	13 (14-21)	19 (14-21)	18 (14-21)	19 (16-25)	20 (16-25)	24 (16-20)	17 (16-20)	17 (17)	19 (17)	18
S. Diversity	1.8 (1.5-2.1)	1.8 (2.1-3.8)	2.7 (2.1-3.8)	2.7 (3.0-4.0)	3.3 (3.0-4.0)	3.3 (3.0-4.0)	3.5 (3.0-4.0)	3.6 (3.0-4.0)	3.0 (2.7-3.7)	3.2 (2.7-3.7)	3.5 (3.1-3.8)	3.0
EPT/EPTC	0.16 (.06-.26)	0.27 (.67-.96)	0.86 (.67-.96)	0.88 (.73-.84)	0.79 (.73-.84)	0.84 (.74-.90)	0.81 (.74-.90)	0.91 (.91-.93)	0.74 (.52-.93)	0.86 (.74-.90)	0.72 (.60-.82)	0.80
Baetidae/Ephem.	0.95 (.67-1.00)	0.98 (.72-.99)	0.79 (.54-.97)	0.93 (.71-.99)	0.60 (.29-.77)	0.86 (.45-.91)	0.65 (.45-.91)	0.62 (.45-.90)	0.67 (.45-.90)	0.74 (.45-.90)	0.43 (.19-.69)	0.50
Hydropsychinae/Trich.	0.93 (.72-.99)	1.00 (.72-.99)	0.88 (.71-.99)	0.95 (.63-.96)	0.82 (.63-.96)	0.87 (.81-.95)	0.87 (.81-.95)	0.89 (.82-.98)	0.91 (.82-.98)	0.94 (.82-.98)	0.89 (.72-.97)	0.89
% Filterer	33 (7-53)	44 (32-73)	60 (32-73)	70 (29-61)	51 (29-61)	63 (36-73)	58 (36-73)	69 (48-73)	64 (48-73)	65 (48-73)	59 (52-69)	77
Biotic index	5.6 (5.3-6.1)	5.2 (4.7-5.3)	4.9 (4.7-5.3)	5.0 (4.4-5.3)	4.9 (4.4-5.3)	4.6 (4.2-4.9)	4.5 (4.2-4.9)	4.3 (4.6-5.4)	4.9 (4.6-5.4)	4.7 (4.3-5.0)	4.7 (4.3-5.0)	4.7
Metals index	8.2 (7.6-8.9)	8.0 (4.7-5.6)	5.1 (4.2-5.3)	5.2 (4.0-4.8)	4.9 (4.0-4.8)	4.6 (4.0-4.8)	4.5 (4.0-4.8)	4.2 (4.0-4.8)	4.9 (4.6-5.4)	4.7 (4.6-5.4)	4.2 (3.5-4.7)	4.1

Stream reaches: SBC = stations 00, 01 & 02.5, CFR1 = stations 07, 09 & 10, CFR2 = stations 11, 11.7, 12 & 13, CFR3 = stations 15.5 & 18, CFR4 = stations 20 & 22, CFR5 = stations 24 & 25.
1996 values in bold were outside established ranges.

Table 5. Macroinvertebrate community biointegrity estimates for Clark Fork River Basin stations during August, 1996.

Station	% Biointegrity		
	overall	metals subset	organic subset
SF-1	65 **	67 *	78 *
00	30 ***	33 ***	75 *
01	27 ***	39 ***	61 *
02.5	50 **	44 **	75 *
04.5	62 **	72 *	50 **
06	90	83	92
07	77 *	83	67 *
09	55 **	78 *	39 ***
10	65 **	83	50 **
10.2	92	89	89
11	78 *	83	67 *
11.5	85 *	94	67 *
11.7	70 *	83	67 *
12	70 *	83	72 *
12.5	95	89	100
13	94	94	83
14	92	83	92
15.5	85 *	94	72 *
18	86 *	94	67 *
19	85 *	89	72 *
20	76 *	89	61 *
22	75 *	78 *	67 *
24	73 *	83	61 *
25	77 *	94	56 **
Reach means			
SBC	36 ***	39 ***	70 *
CFR1	66 **	81	52 **
CFR2	78 *	86	72 *
CFR3	86 *	94	70 *
CFR4	76 *	84	64 *
CFR5	75 *	89	59 **
ALL	73 *	80	70 *

Classification : slightly impaired *, moderately impaired **, severely impaired ***.

Table 6. Mean macroinvertebrate biointegrity (%) and Spearman rank correlation coefficients (rs) for long-term Clark Fork River Basin monitoring stations - August, 1986-1996.

station	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean	C.V.(%)	rs	P value
00	18	32	15	22	35	17	22	35	27	30	25	30	.54	.000	
01	38	17	32	13	26	25	20	20	21	25	27	24	.23	.14	
02.5 *	38	40	35	50	43	43	47	55	43	50	44	13	.34	.02	
04.5 **	45	44	44	47	41	45	71	70	59	62	53	22	.62	.000	
06	67	78	80	82	78	91	77	91	75	90	81	10	.53	.000	
07	59	64	53	59	55	65	65	83	82	88	77	68	.18	.73	.000
09	52	65	62	73	61	83	55	86	53	58	55	64	.19	.00	.99
10	52	68	71	80	79	86	68	87	59	74	65	72	.15	.13	.39
11	86	80	85	88	63	89	85	92	94	86	78	84	.10	.15	.32
12	64	80	58	76	61	64	56	89	76	74	70	70	.15	.18	.26
13	88	80	76	88	86	92	83	95	89	94	94	88	.7	.56	.000
14	82	83	90	85	92	88	89	90	95	97	92	89	.5	.75	.000
15.5	76	88	86	77	68	79	80	90	82	83	85	81	.8	.26	.12
18	73	88	91	80	86	91	83	95	80	94	86	86	.8	.27	.07
19	79	83	82	91	85	86	79	90	73	98	85	85	.8	.20	.18
20	71	77	61	79	73	79	76	61	79	82	76	74	.10	.20	.19
22	62	86	68	89	88	71	74	85	68	79	75	77	.12	.05	.76
24	90	79	76	73	88	85	92	91	74	89	73	83	.9	-.10	.53
25	83	85	82	76	80	83	88	80	82	98	77	83	.7	.09	.56
27	65	68	64	67	72	67	67	78	72	72	69	69	.6	.15	.37
Mean	67	68	67	69	67	73	68	76	72	75	71	70	.5	.76	.007
Reach means *															
SBC	25	33	26	30	34	27	30	37	32	36	31	13	.22	.25	
CFR1	54	66	62	71	65	78	63	85	65	73	66	68	.12	.30	.09
CFR2	79	80	73	84	70	82	75	92	86	85	81	81	.8	.26	.14
CFR3	75	88	89	79	77	85	82	93	81	89	86	84	.7	.24	.28
CFR4	67	82	65	84	81	75	75	73	74	81	76	75	.8	.14	.54
CFR5	87	82	79	75	84	84	90	86	78	94	75	83	.7	-.02	.94

* data for station 03: 1986-1992, station 02.5: 1993-1996; ** data for station 04:1986-1992, station 04.5: 1993-1996.

* Stream reaches: SBC = stations 00, 01 & 02.5, CFR1 = stations 07, 09 & 10, CFR2 = stations 11,12, & 13, CFR3 = stations 15.5 & 18, CFR4 = stations 20 & 22, CFR5 = stations 24 & 25.

Table 7. Macroinvertebrate biointegrity (%) as measured by metrics* sensitive to metals pollution and Spearman rank correlation coefficients (rs) for long-term Clark Fork River Basin stations - August, 1986-96.

station	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean	C.V.(%)	rs	P value
00	0	0	11	22	17	11	11	39	17	33	16	79	.70	.000	
01	39	6	44	33	44	33	28	44	44	28	39	35	.33	.14	.38
02.5	22	17	44	28	22	28	50	33	56	22	44	33	40	.36	.016
04.5	61	61	67	67	61	72	72	61	72	61	72	66	8	.54	.000
06	50	56	67	72	67	83	72	83	67	83	70	70	16	.71	.000
07	72	72	78	72	72	72	72	83	83	78	83	76	7	.67	.000
09	78	78	72	83	72	83	72	78	72	72	78	76	6	-.06	.70
10	72	78	72	67	78	83	78	78	78	78	83	77	6	.55	.000
11	83	78	78	89	67	83	78	89	94	83	83	82	9	.34	.022
12	78	83	78	78	72	78	78	83	83	83	80	80	4	.18	.25
13	78	89	94	83	78	89	94	94	94	89	94	88	7	.50	.000
14	61	83	83	67	83	72	100	83	94	94	83	82	14	.52	.000
15.5	83	92	92	72	72	78	83	83	89	94	94	86	8	.36	.026
18	83	89	89	83	89	89	94	94	94	94	94	90	5	.34	.023
19	83	89	89	94	83	89	89	78	83	100	89	88	7	-.11	.46
20	83	83	78	78	83	83	89	83	89	89	89	83	5	.44	.003
22	83	89	83	89	78	83	83	83	83	83	78	83	4	-.33	.027
24	89	83	89	83	94	83	94	94	83	94	83	88	6	-.14	.36
25	67	89	94	83	89	83	89	89	94	94	100	94	10	.59	.000
27		72	78	72	78	78	78	67	78	67	78	74	6	-.27	.12
mean	70	69	73	70	71	73	75	75	79	74	78	73	4	.87	.001
Reach means															
SBC	8	29	24	29	26	30	29	46	22	39	28	36	.31	.043	
CFR1	74	76	74	74	74	79	74	80	78	76	81	76	4	.33	.032
CFR2	80	83	83	83	72	83	83	89	89	85	87	83	5	.34	.038
CFR3	83	91	91	78	84	86	89	89	92	92	94	88	5	.36	.016
CFR4	83	86	81	84	78	83	83	86	83	86	84	83	3	.19	.51
CFR5	78	86	92	83	92	83	92	94	89	97	89	88	6	.52	.049

* metric subset: metals tolerance index, EPT richness and community density.

** data for station 03: 1986-1992, station 02.5: 1993-1996, *** data for station 04:1986-1992, station 04.5: 1993-1996.

Table 8. Macroinvertebrate biointegrity (%) as measured by metrics* sensitive to organic pollution and Spearman rank correlation coefficients (rs) for long-term Clark Fork River Basin stations - August, 1986-1996.

station	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean	C.V. (%)	rs	P value
00	83	83	58	75	83	67	83	83	75	75	77	11	.17	.29	
01	67	67	67	17	50	58	42	28	33	67	61	51	36	.02	.92
02.5 **	83	83	33	100	83	75	42	92	61	92	75	74	28	-.02	.92
04.5 ***	50	56	44	39	39	56	83	72	56	50	55	55	26	.25	.12
06	100	92	75	94	83	94	92	94	92	92	91	8	-.09	.59	
07	72	72	50	78	56	72	83	83	83	83	67	73	16	.40	.007
09	56	67	50	61	44	83	50	89	50	50	39	58	27	-.19	.20
10	39	61	56	83	67	89	67	83	50	67	50	65	24	.09	.58
11	89	72	92	89	42	89	78	94	89	83	67	80	19	-.20	.19
12	72	83	33	67	61	50	44	89	72	67	72	65	26	-.02	.88
13	89	67	44	89	83	83	67	92	89	89	83	80	18	.31	.042
14	100	83	83	100	100	100	94	92	92	100	92	94	7	.15	.33
15.5	72	75	81	58	42	78	83	100	78	67	72	73	20	.22	.18
18	67	89	94	78	72	89	61	89	61	89	67	78	16	-.20	.20
19	72	72	72	83	72	78	67	92	56	94	72	75	14	.06	.68
20	67	67	39	78	67	72	61	33	67	67	61	62	22	-.06	.71
22	61	78	50	89	92	61	61	78	33	67	67	67	25	.09	.57
24	83	72	61	61	78	83	89	89	61	78	61	74	16	-.10	.53
25	92	83	72	72	72	83	83	61	72	94	56	76	16	-.26	.08
27	42	56	56	33	50	61	42	67	50	50	51	51	21	.02	.93
Mean	74	73	62	73	66	76	67	79	68	76	67	72	8	.11	.75
Reach means															
SBC	78	61	58	69	72	50	68	59	78	70	67	13	-.01	.95	
CFR1	56	67	52	74	56	81	67	85	61	67	52	65	17	.06	.73
CFR2	83	74	56	82	62	74	63	92	83	80	74	75	14	.08	.66
CFR3	70	82	88	68	57	84	72	95	70	78	70	76	14	-.04	.86
CFR4	64	73	45	84	80	67	61	56	50	67	64	64	18	-.14	.53
CFR5	88	78	67	67	75	83	86	75	67	86	59	75	13	-.20	.37

* metric subset: biotic index, % filterers and community density.

** data for station 03: 1986-1992, station 02.5: 1993-1996; *** data for station 04:1986-1992, station 04.5: 1993-1996.

Table 9. Densities (number per square meter) and frequency of occurrence (percentage of samples) of selected indicator taxa in the upper Clark Fork River, 1986 through 1996.

taxon:	Hетагенидæ		Tanytarsini		Arctopsyche		Claassinia		Hesperoperla	
date:	86-92	93-96	86-92	93-96	86-92	93-96	86-92	93-96	86-92	93-96
station 04/04.5										
# sq. meter	0	0	4	84	0	0	0	0	0	0
% occurrence	0	0	21	81	0	0	0	0	0	0
station 06										
# sq. meter	3	45	180	833	43	374	0	0	42	79
% occurrence	13	69	83	100	46	94	0	0	71	88
station 07										
# sq. meter	<1	8	14	639	1	4	<1	0	37	75
% occurrence	4	31	46	100	7	19	4	0	79	88
station 08										
# sq. meter	<1		5		0		0		0	
% occurrence	0		11		0		0		0	
station 09										
# sq. meter	0	0	4	21	0	10	0	<1	0	0
% occurrence	0	0	14	44	0	31	0	6	0	0
station 10										
# sq. meter	5	2	10	17	2	14	0	<1	0	1
% occurrence	18	13	29	44	7	63	0	6	0	13
station 11										
# sq. meter	36	48	16	31	30	125	7	38	6	10
% occurrence	64	94	54	75	64	100	36	81	32	63
station 11.7										
# sq. meter		93		87		107		74		2
% occurrence		88		69		69		81		19
station 12										
# sq. meter	53	49	30	28	22	13	44	148	5	3
% occurrence	63	69	56	56	56	38	85	75	15	19
station 13										
# sq. meter	93	254	358	535	530	332	38	86	11	27
% occurrence	79	94	93	100	93	100	68	94	39	50

Figure 2. Mean biointegrity in Clark Fork River Basin reaches during 1996.

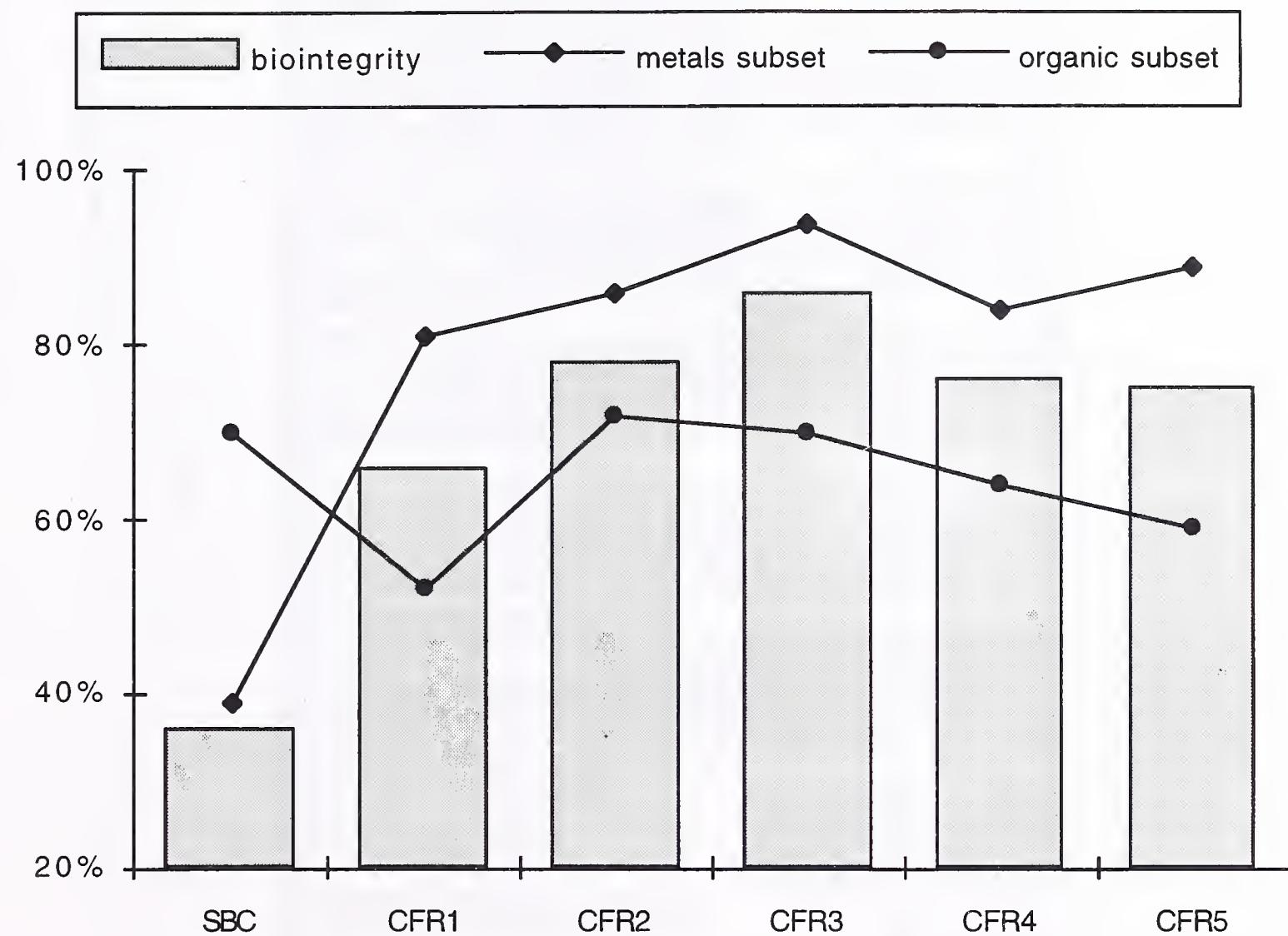


Figure 3. Benthic community biointegrity at 24 stations in the Clark Fork River Basin during August, 1996.

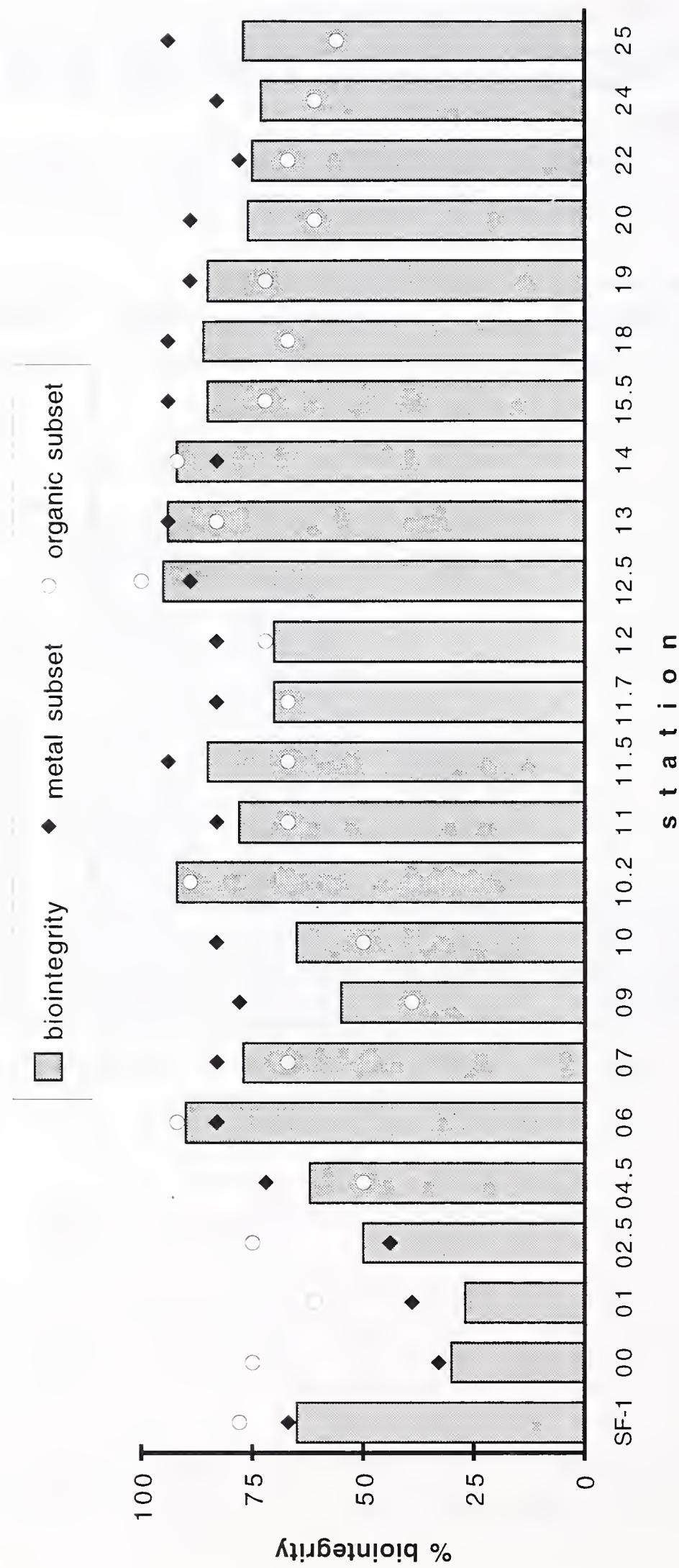


Figure 4. Long-term mean benthic community biointegrity in selected Clark Fork River tributaries (Silver Bow Creek, Warm Springs Creek, Blackfoot River, and Bitterroot River: 1986-1996; all others: 1993-1996).

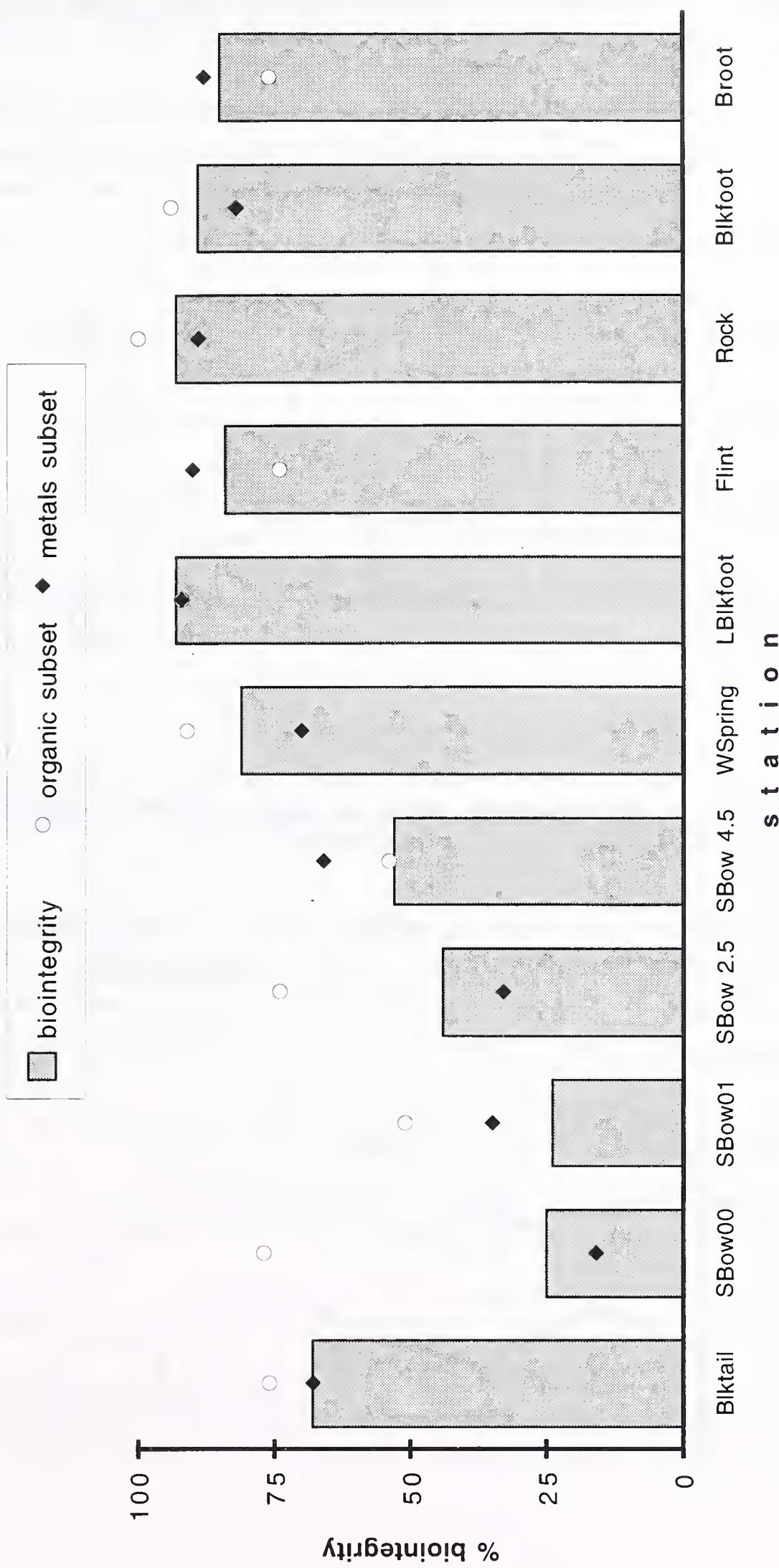


Figure 5. Biointegrity (%) in Blacktail Creek above Grove Gulch (station SF-1), 1993-1996.

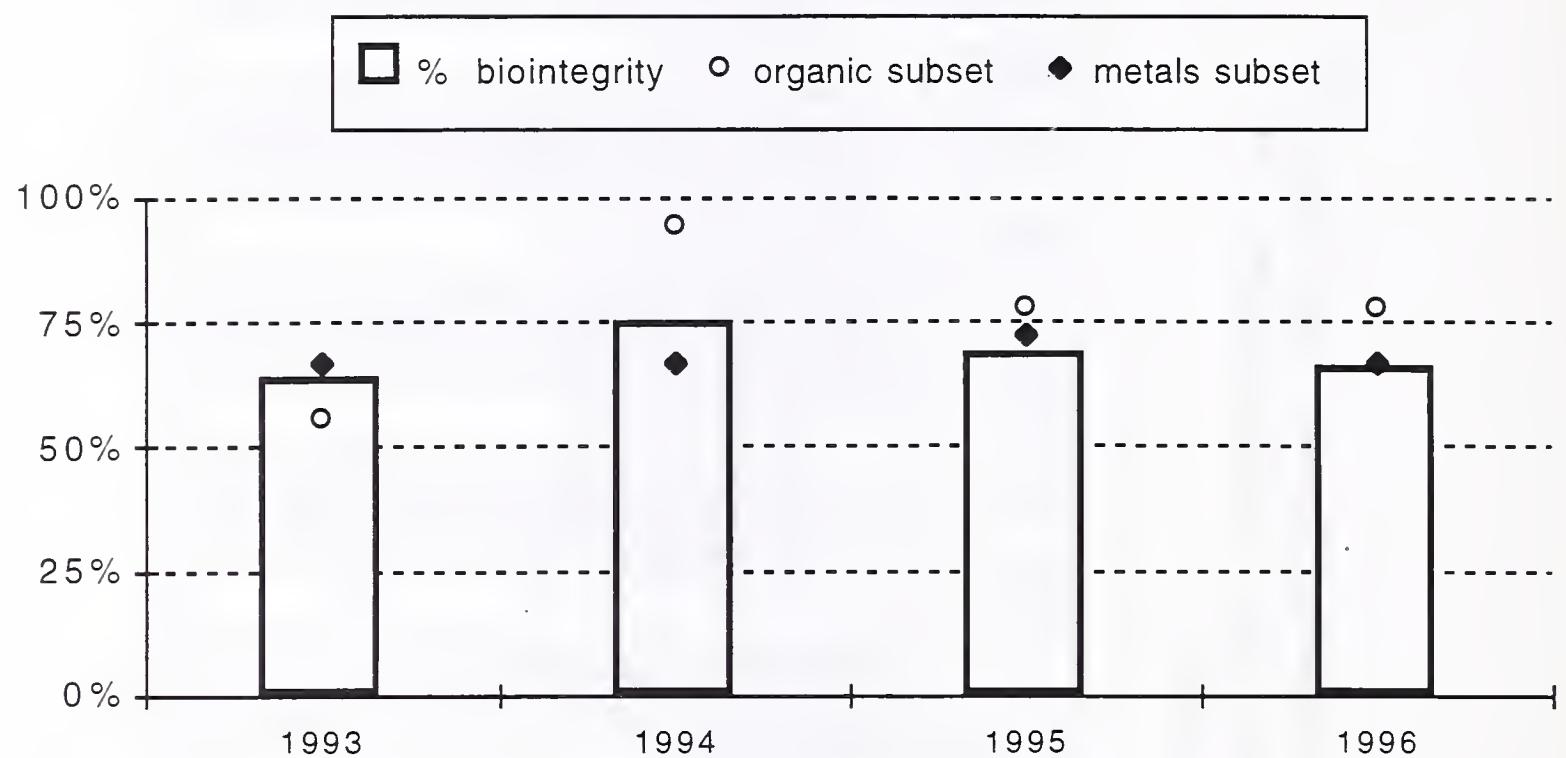


Figure 6. Biointegrity (%) in Silver Bow Creek above the Butte WWTP (station 00), 1987-1996.

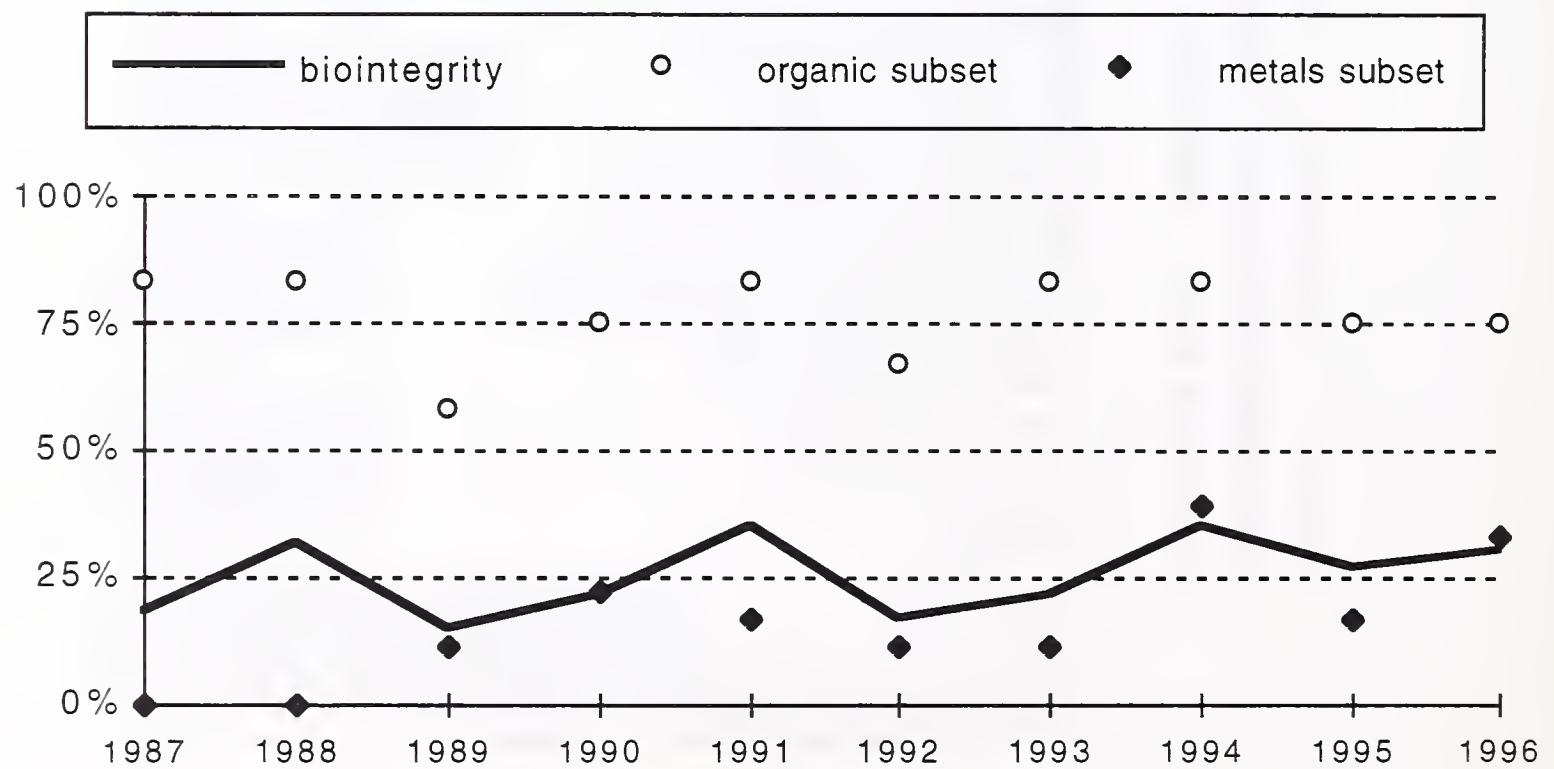


Figure 7. Biointegrity (%) in Silver Bow Creek below the Colorado Tailings (station 01), 1986-1996.

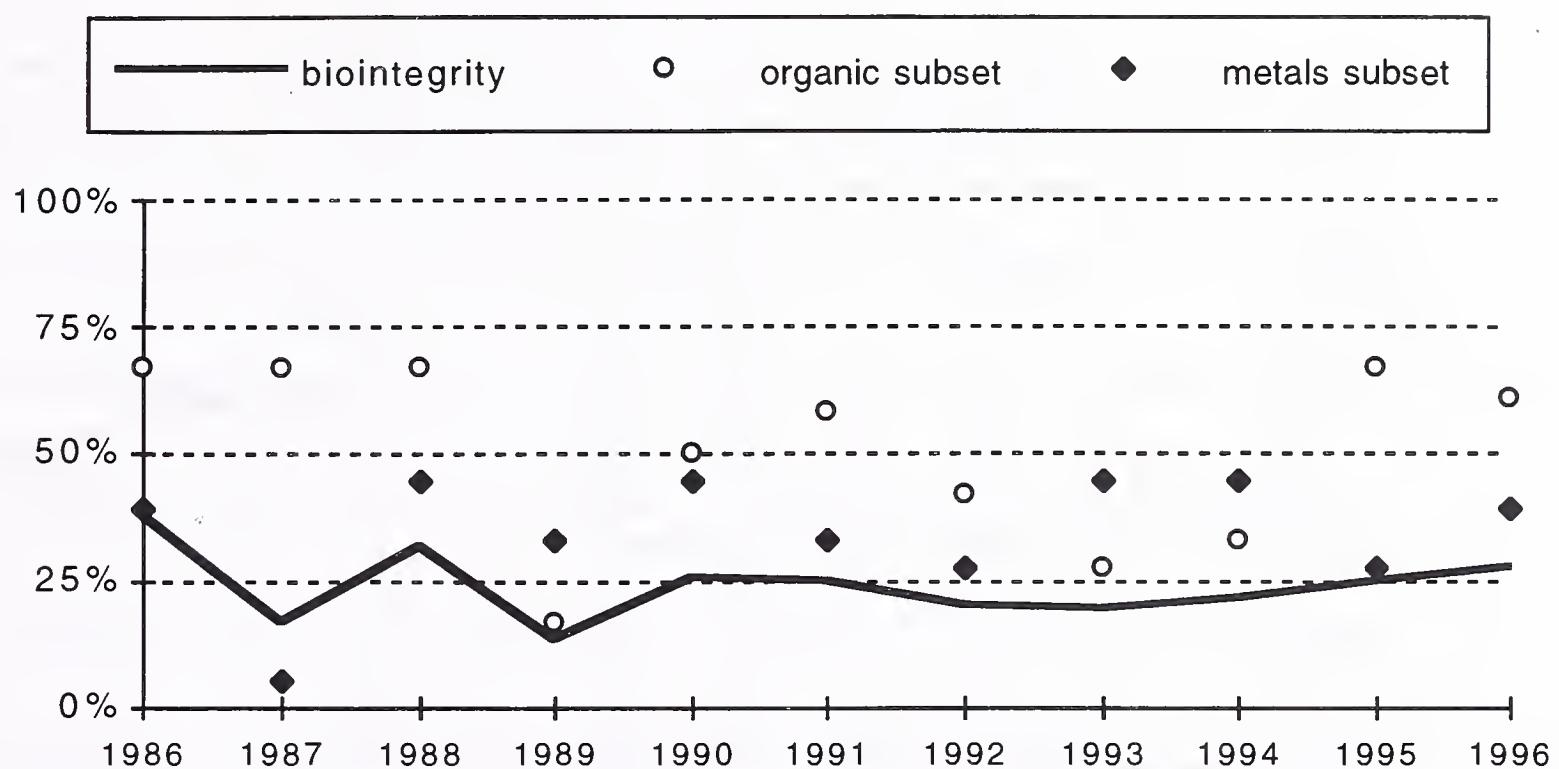


Figure 8. Biointegrity (%) in Silver Bow Creek near Opportunity (station 02.5, 1993-1996; station 03, 1986-1992).

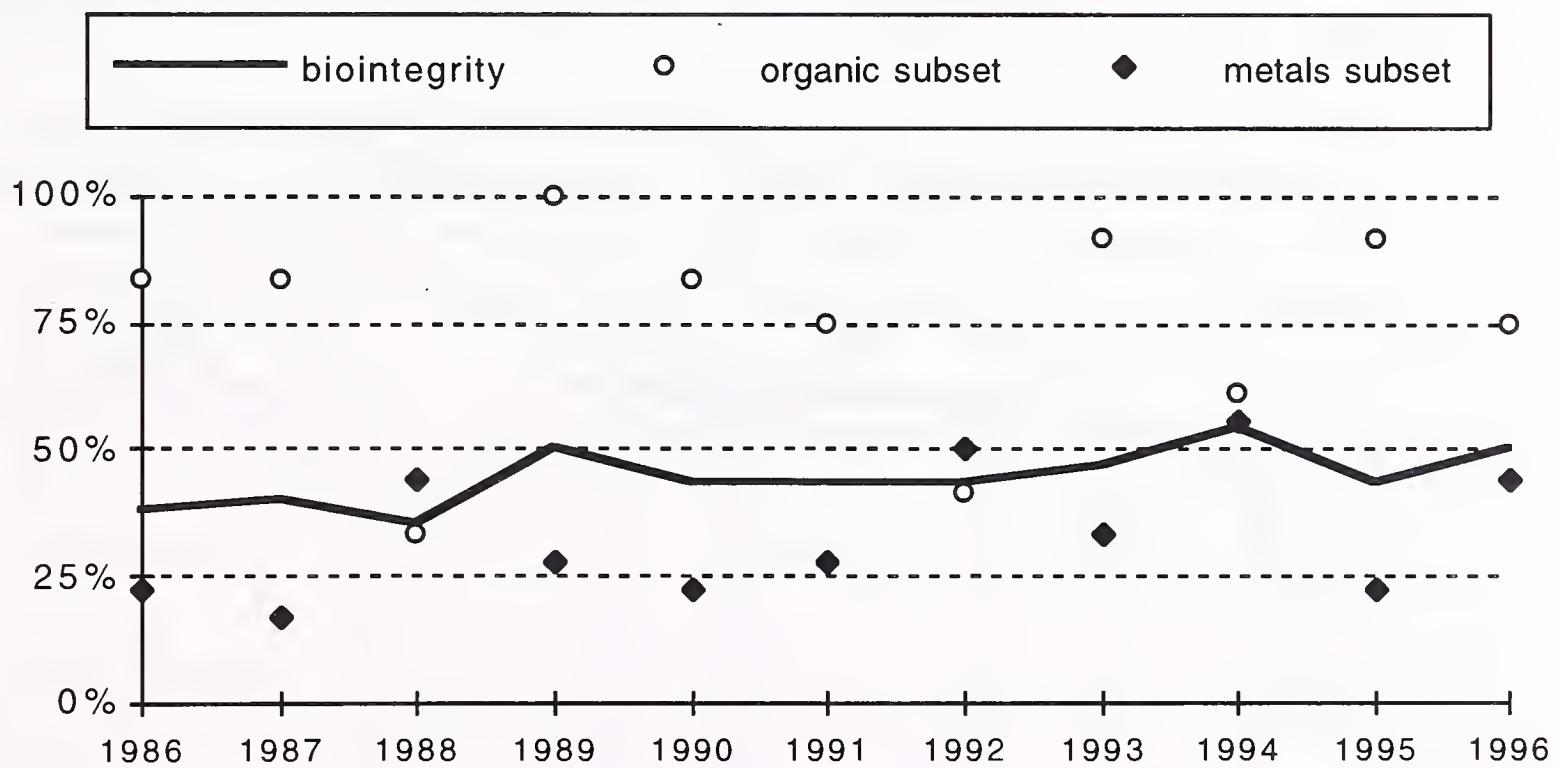


Figure 9. Biointegrity (%) in Silver Bow Creek below the Warm Springs Ponds (station 04, 1986-1991; station 04.5, 1993-1996).

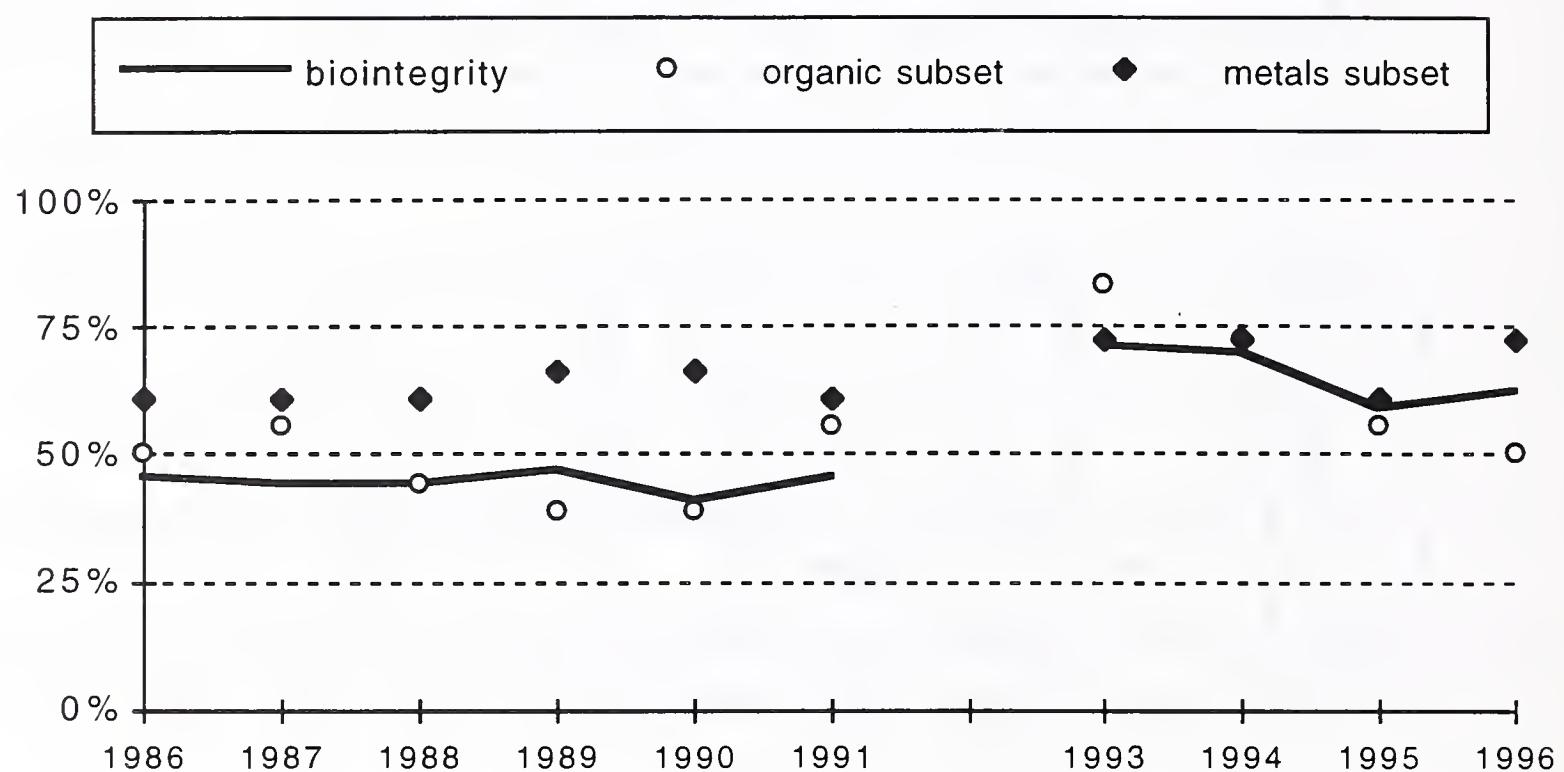


Figure 10. Biointegrity (%) in Warm Springs Creek near mouth (station 06, 1986-1996).

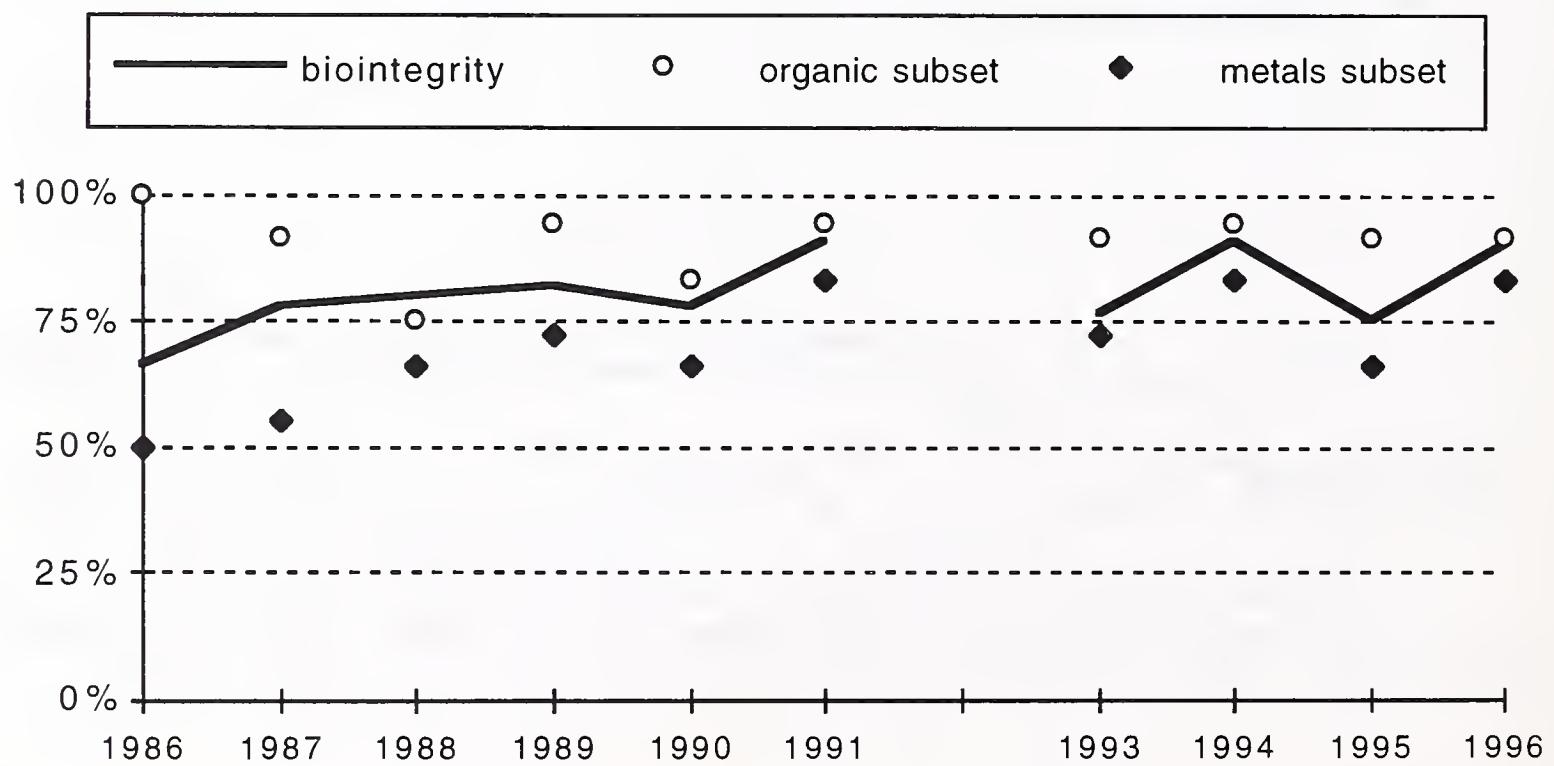


Figure 11. Biointegrity (%) in the Little Blackfoot River near mouth (station 10.2), 1993-1996.

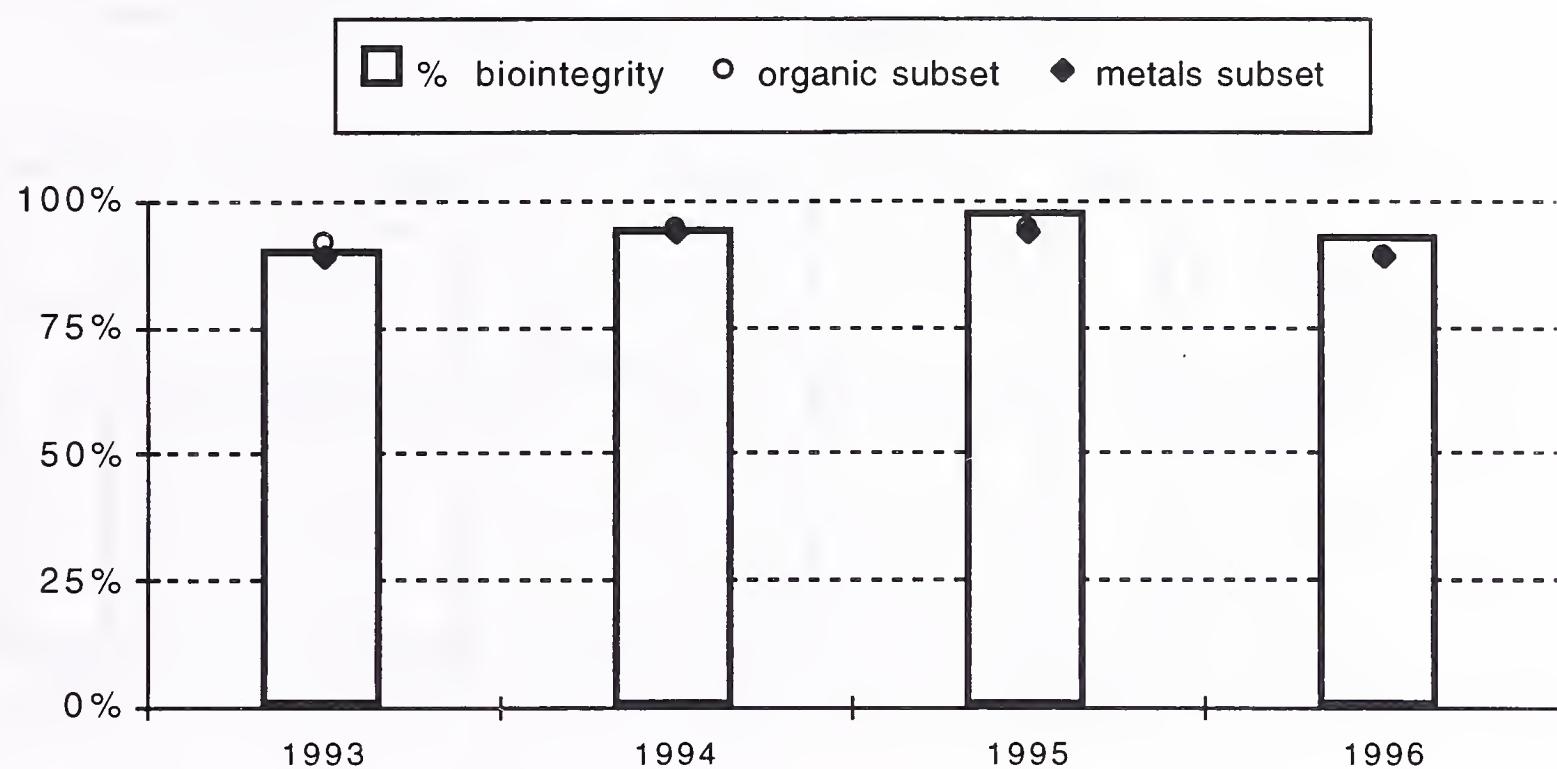


Figure 12. Biointegrity (%) in Flint Creek at New Chicago (station 11.5), 1993-1996.

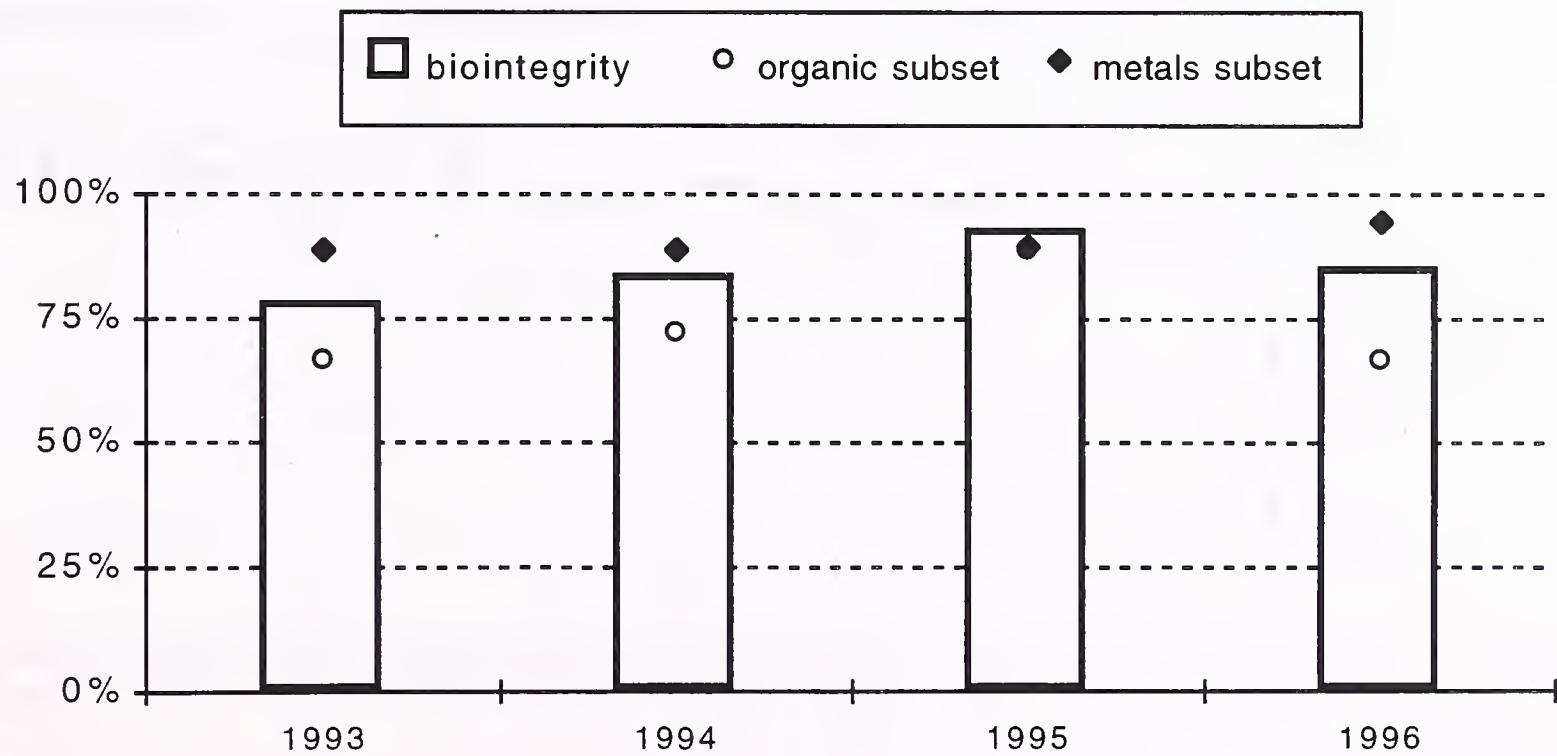


Figure 13. Biointegrity (%) in Rock Creek near mouth (station 12.5), 1993-1996.

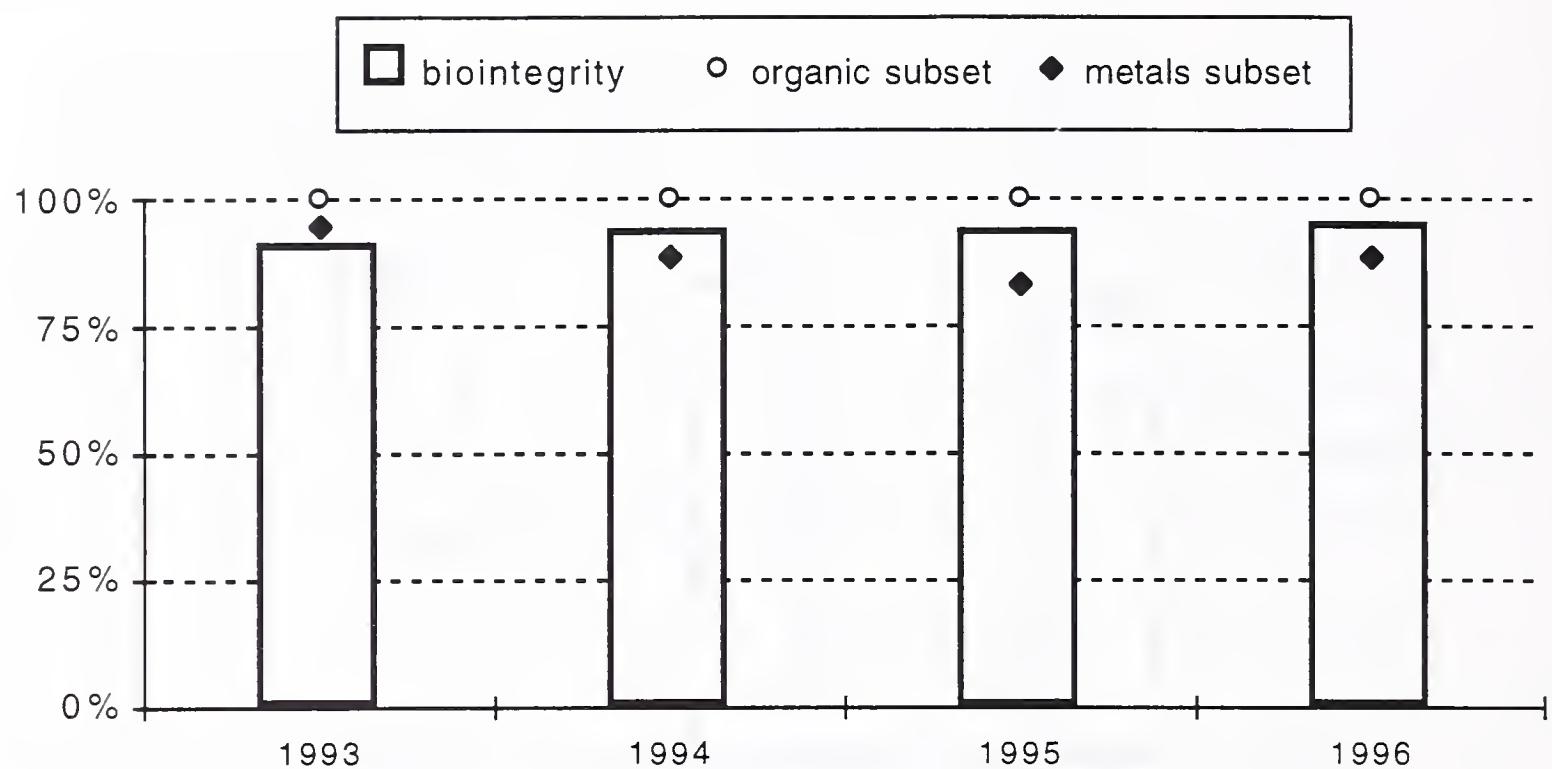


Figure 14. Biointegrity (%) in the Blackfoot River near mouth (station 14), 1986-1996.

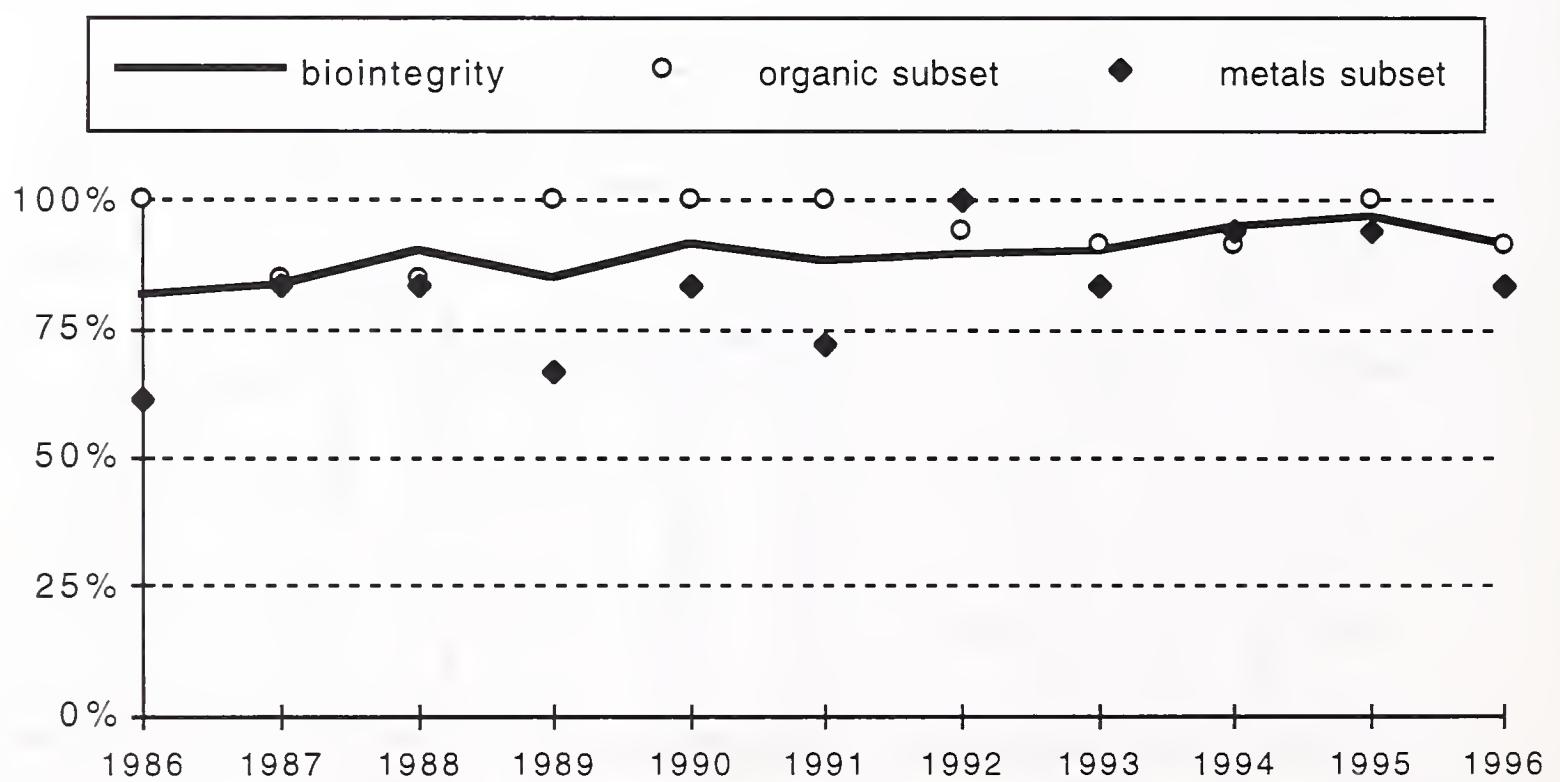


Figure 15. Biointegrity (%) in the Bitterroot River near mouth (station 19), 1986-1996.

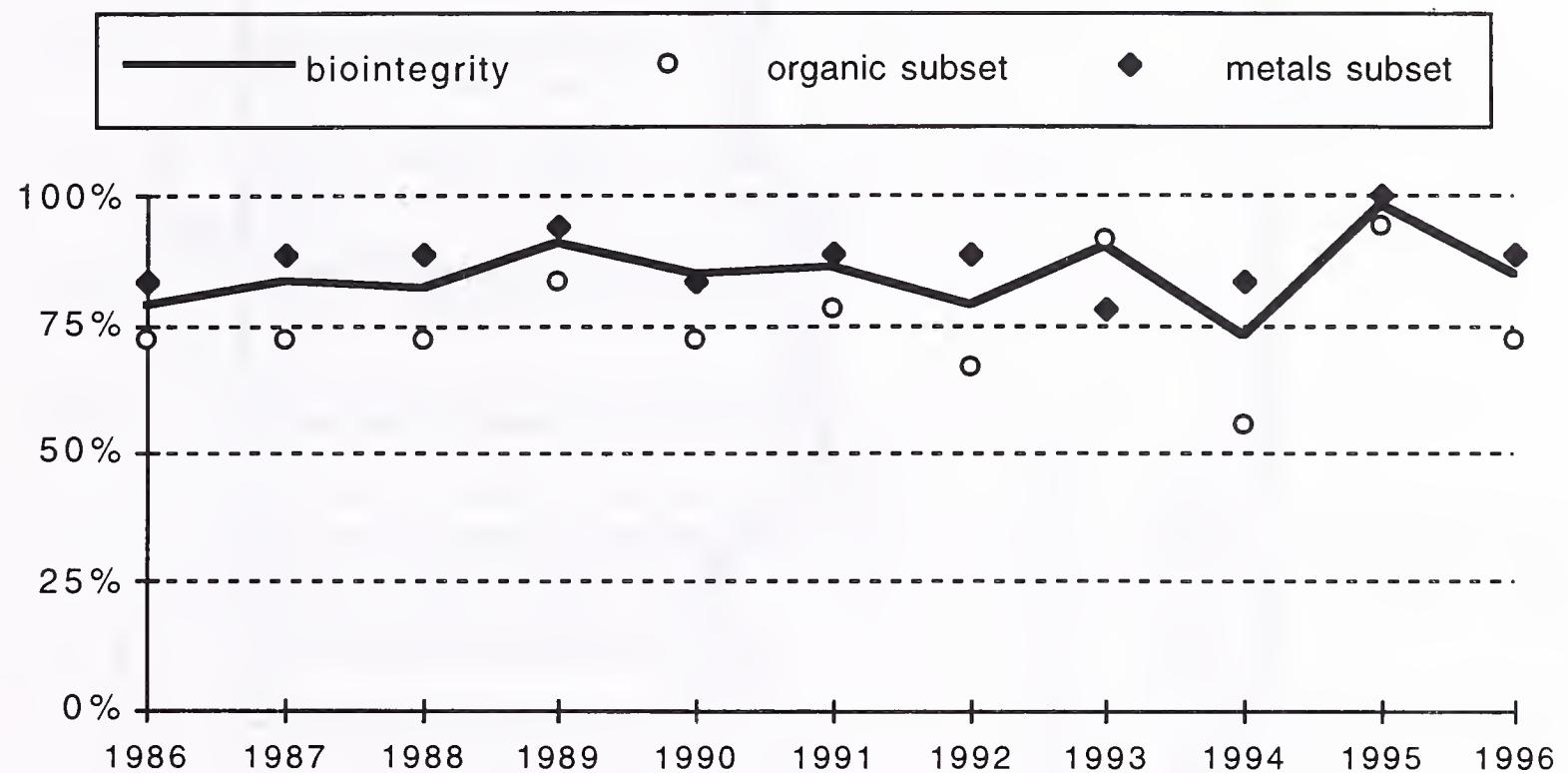


Figure 16. Mean biointegrity at 18 mainstem stations in the Clark Fork River Basin, 1986-1996.

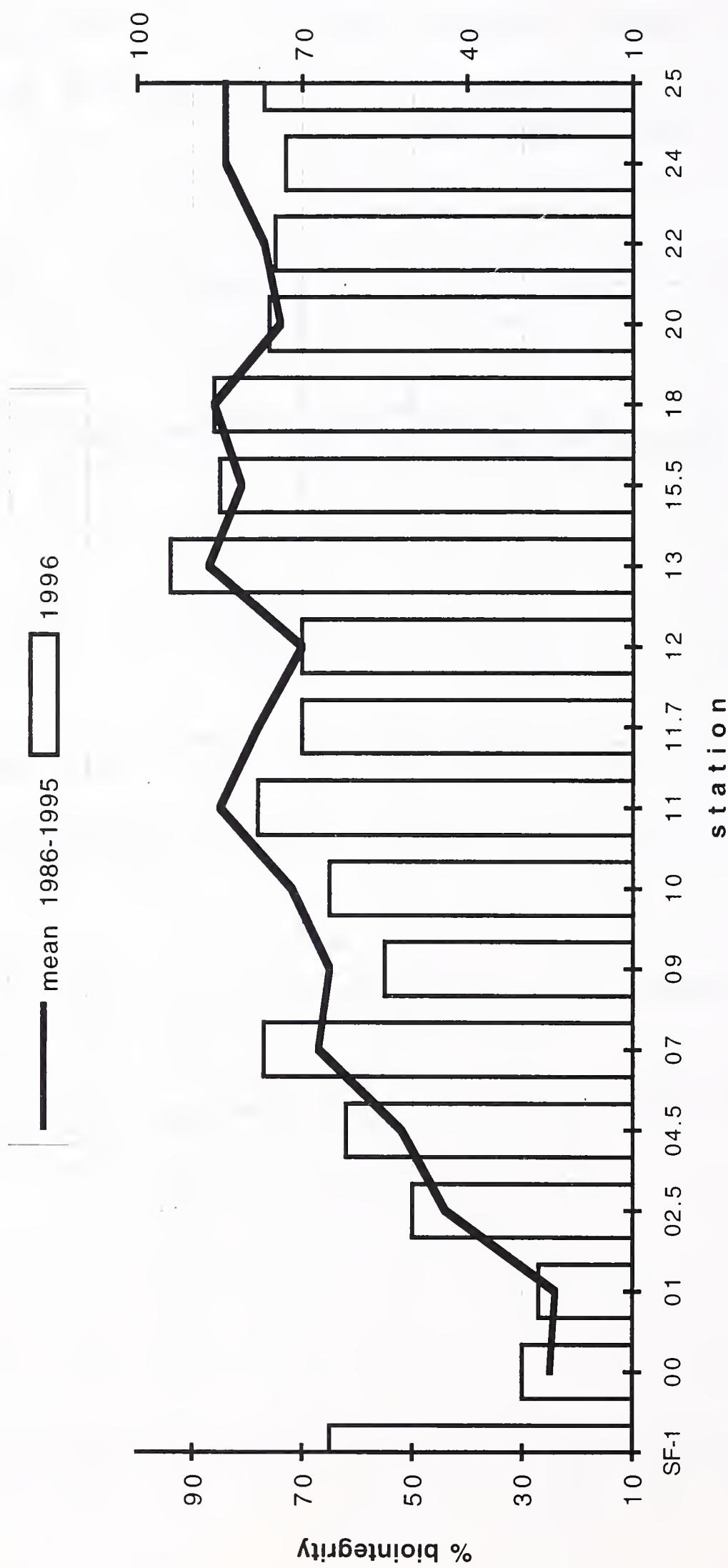


Figure 17. Biointegrity (%) in the Clark Fork River below Warm Springs Creek (station 07), 1986-1996.

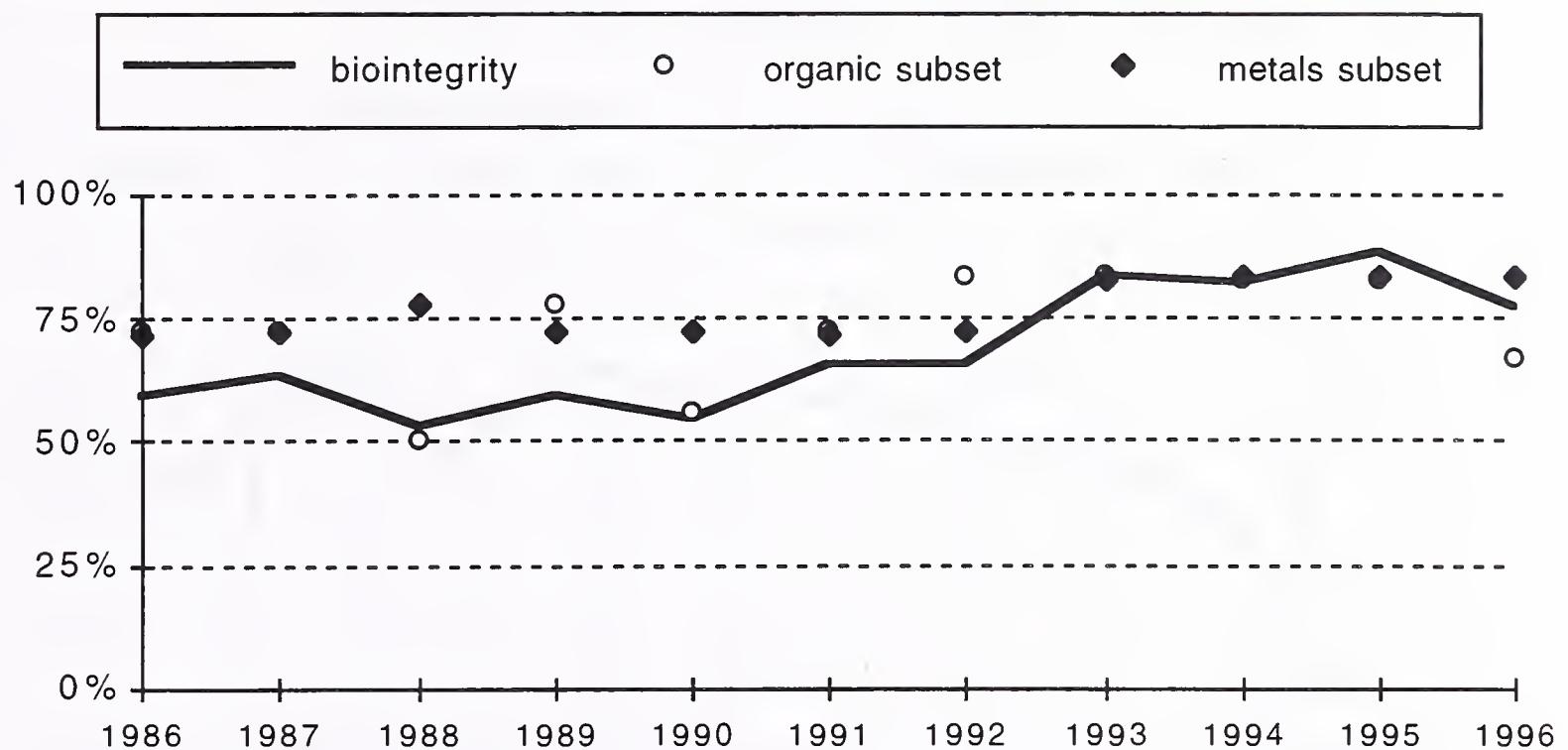


Figure 18. Biointegrity (%) in the Clark Fork River at Deer Lodge (station 09), 1986-1996.

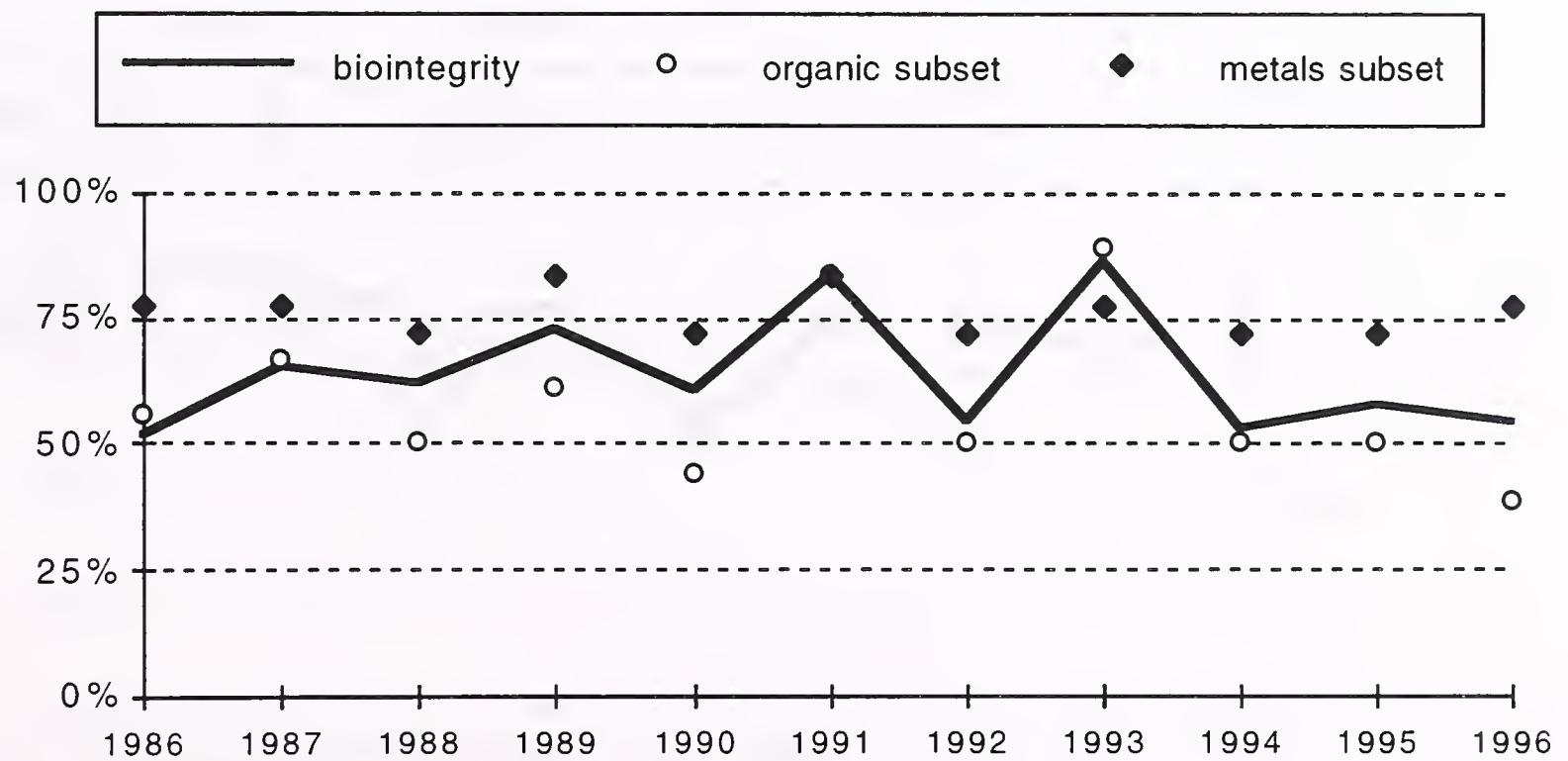


Figure 19. Biointegrity (%) in the Clark Fork River above the Little Blackfoot River (station 10), 1986-1996.

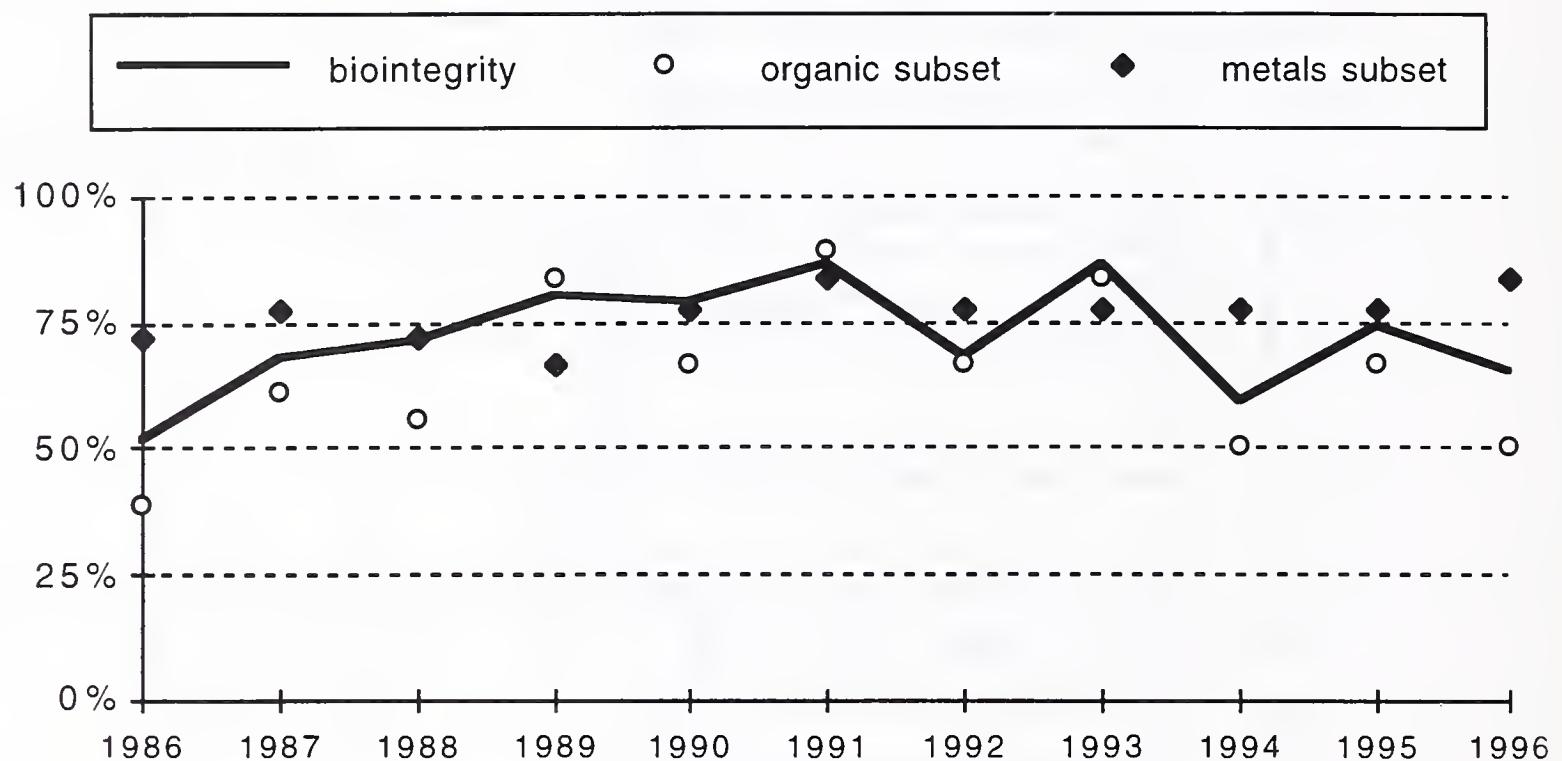


Figure 20. Biointegrity (%) in the Clark Fork River at Gold Creek Bridge (station 11), 1986-1996.

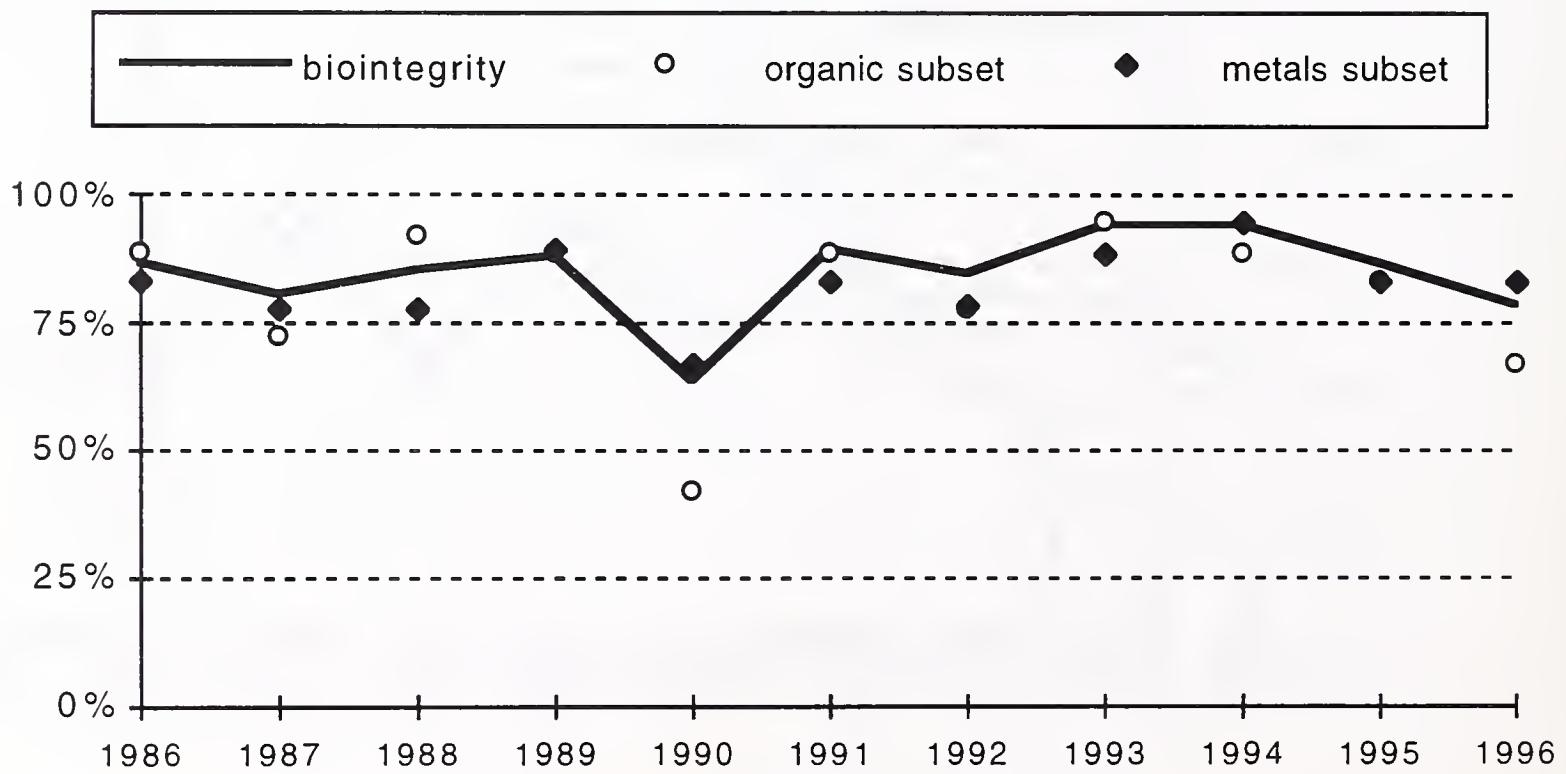


Figure 21. Biointegrity (%) in the Clark Fork River at Bearmouth (station 11.7), 1993-1996.

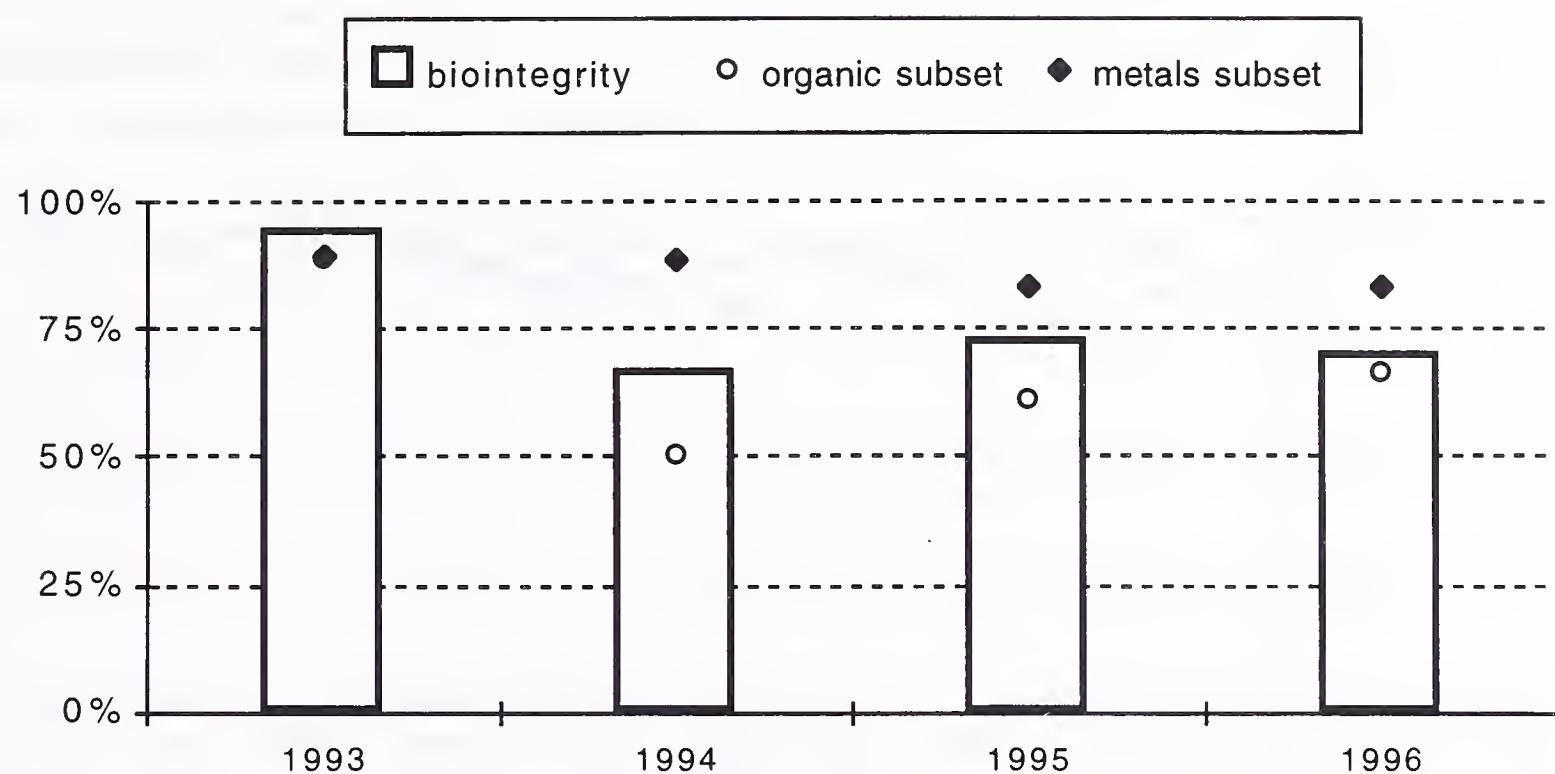


Figure 22. Biointegrity (%) in the Clark Fork River at Bonita (station 12), 1986-1996.

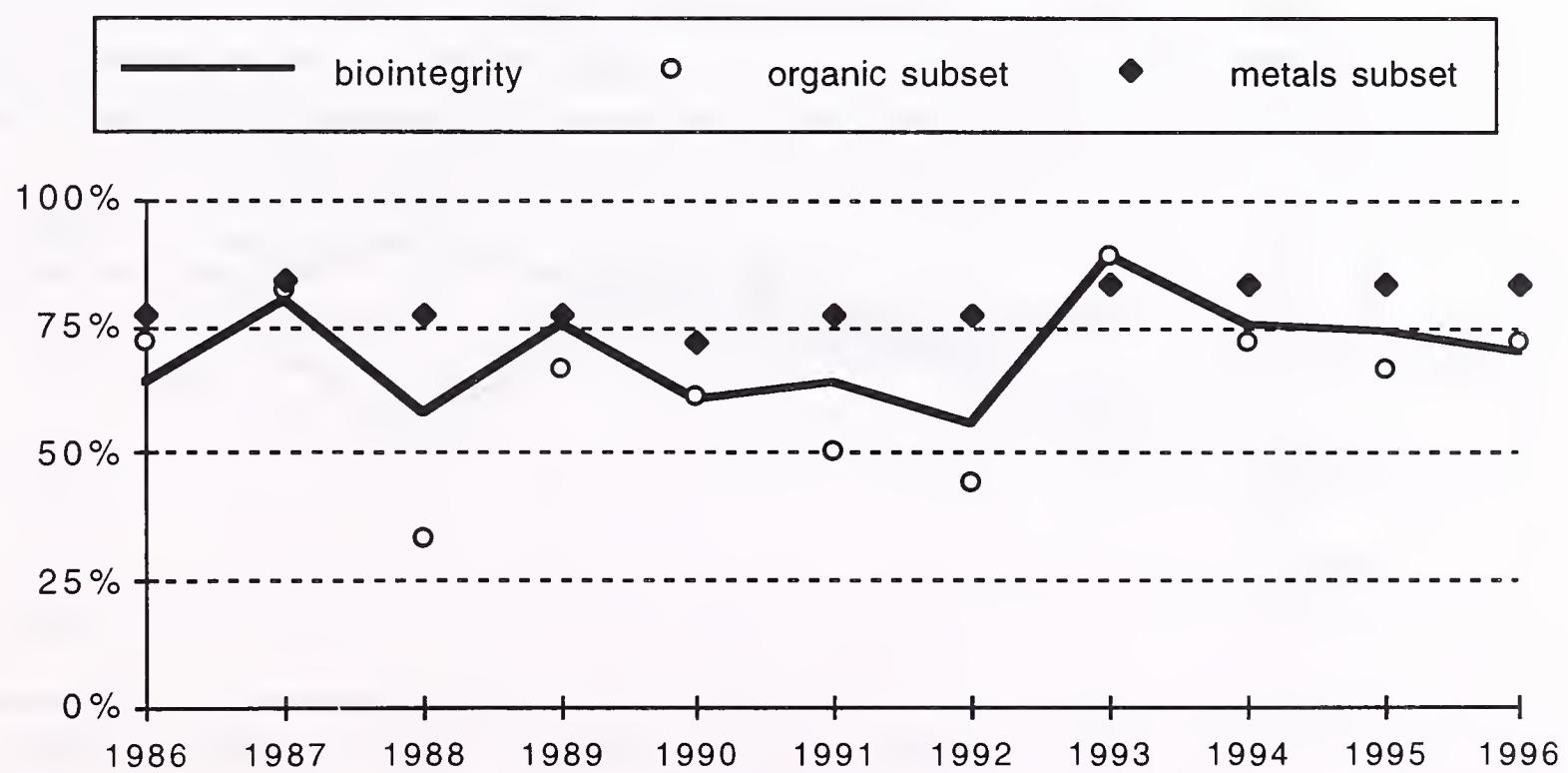


Figure 23. Biointegrity (%) in the Clark Fork River at Turah (station 13), 1986-1996.

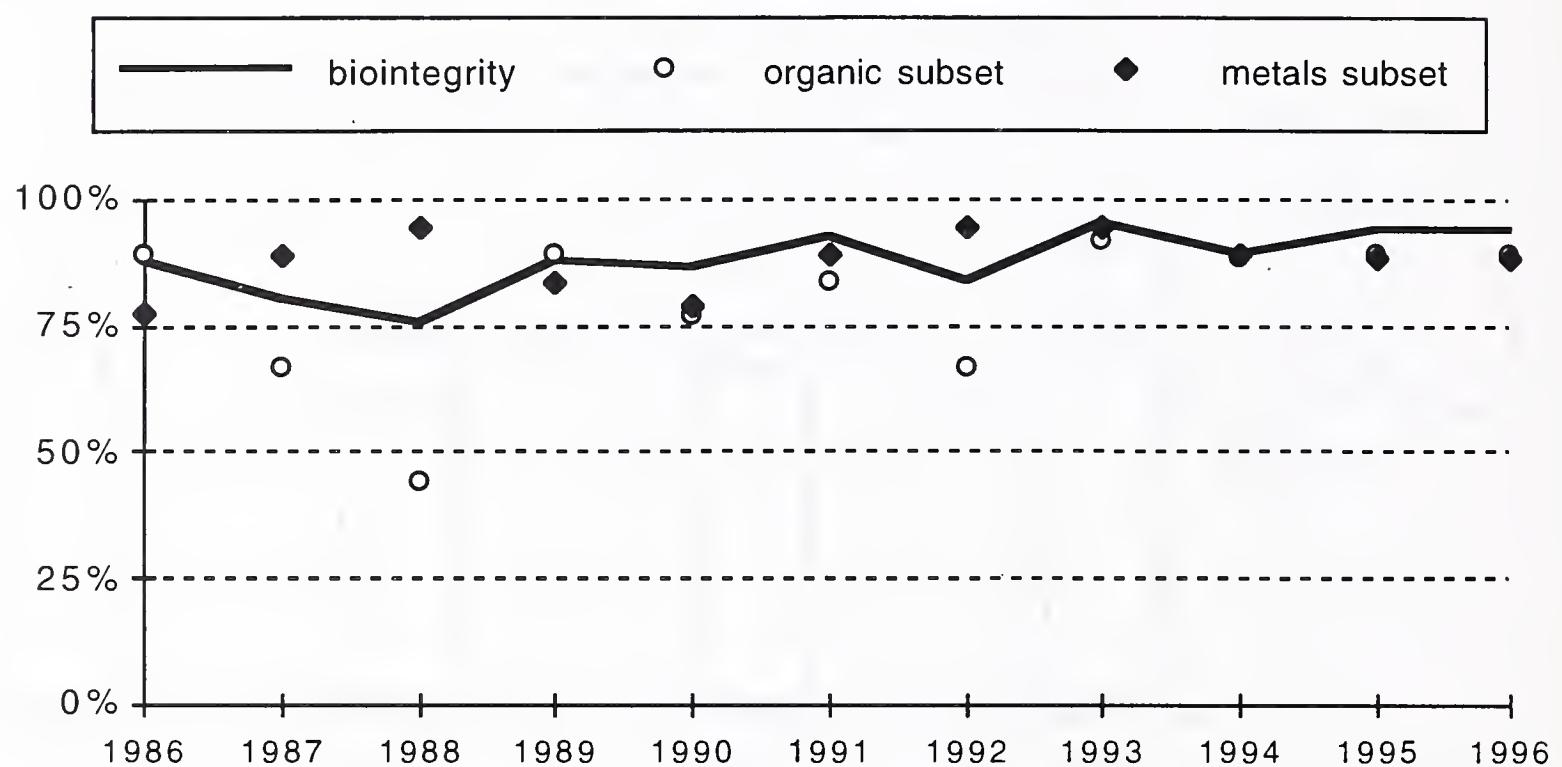


Figure 24. Biointegrity (%) in the Clark Fork River above Missoula (station 15.5), 1989-1996.

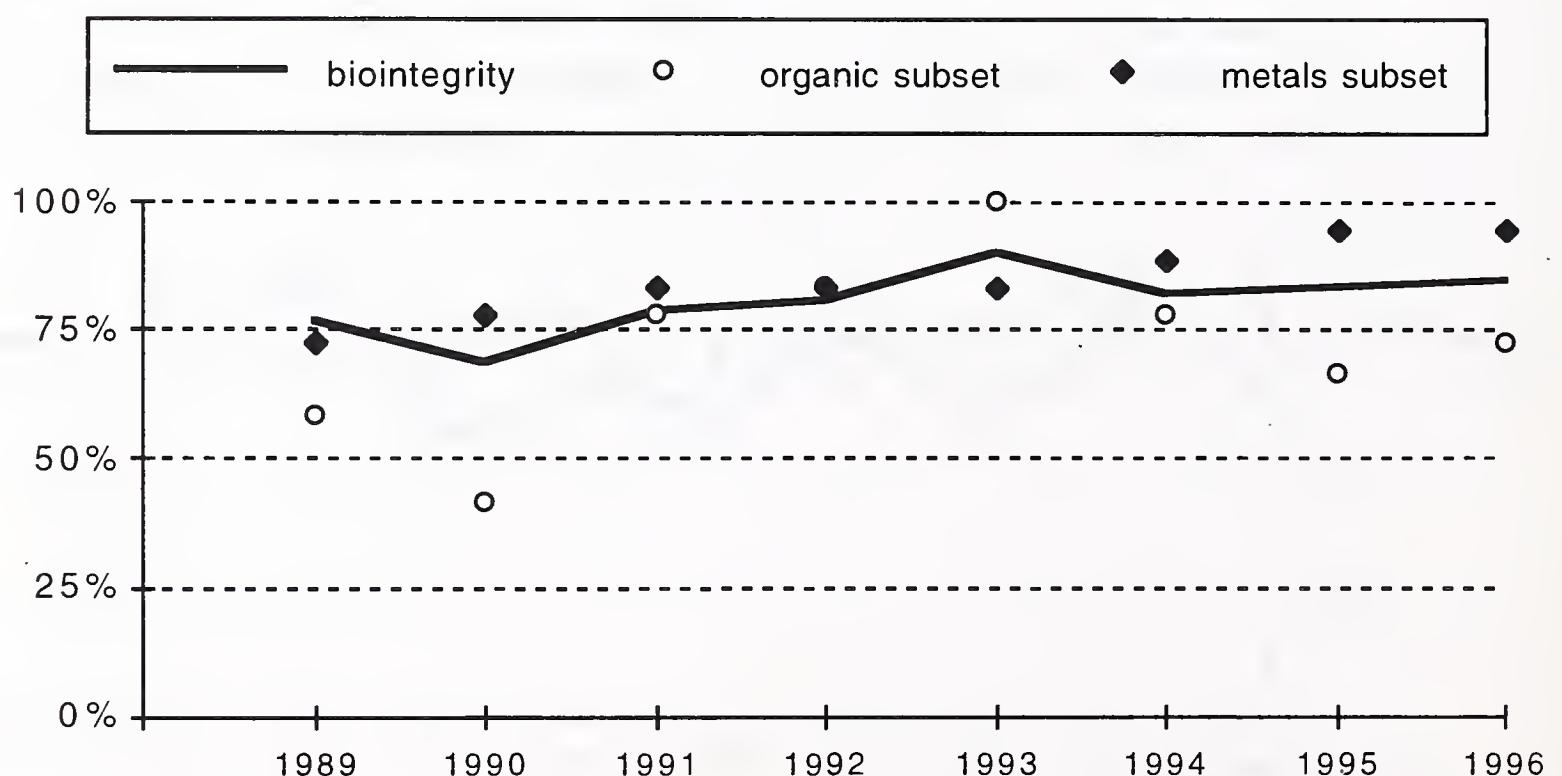


Figure 25. Biointegrity (%) in the Clark Fork River at Shuffields (station 18), 1986-1996.

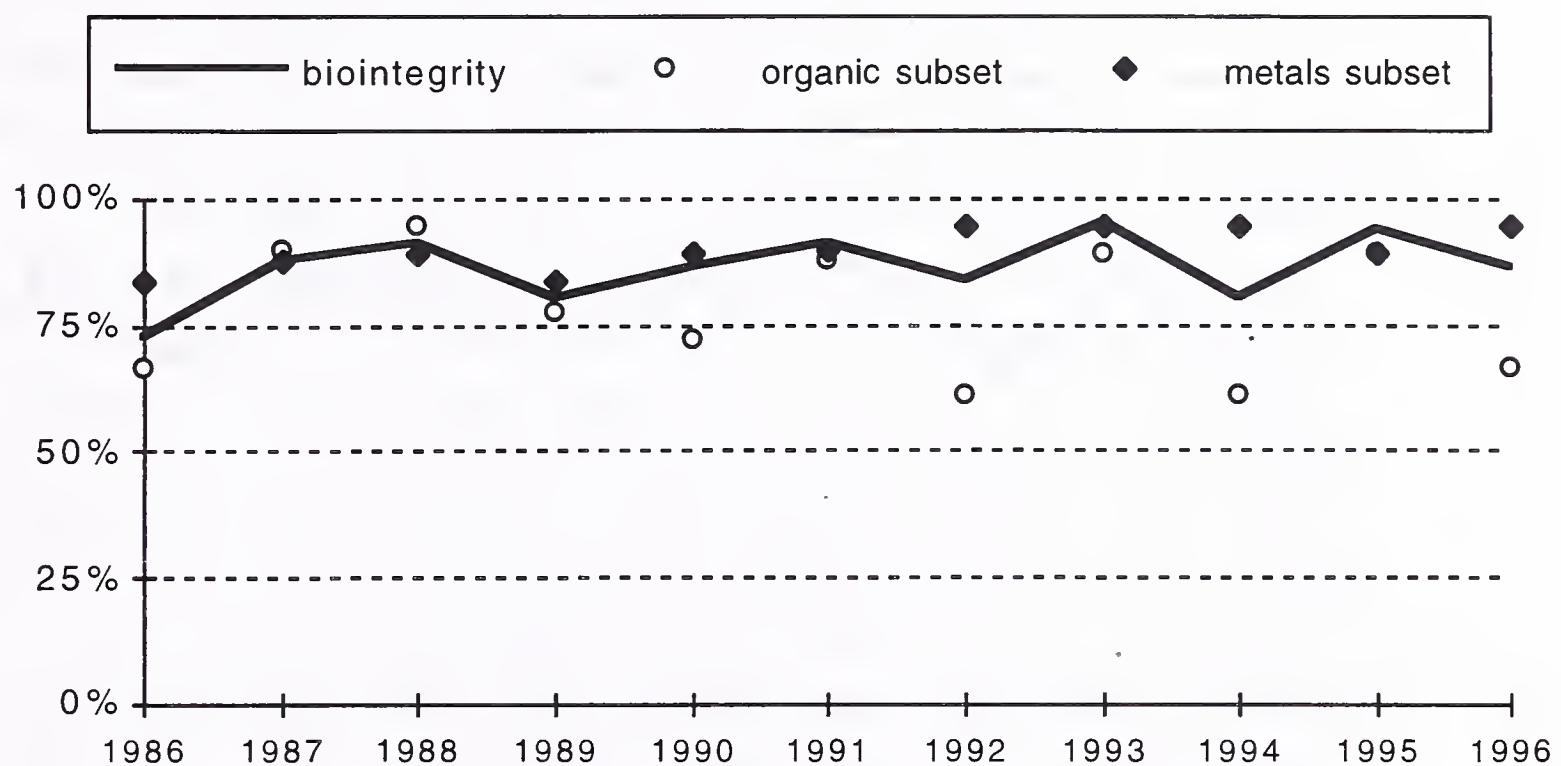


Figure 26. Biointegrity (%) in the Clark Fork River at Harper Bridge (station 20), 1986-1996.

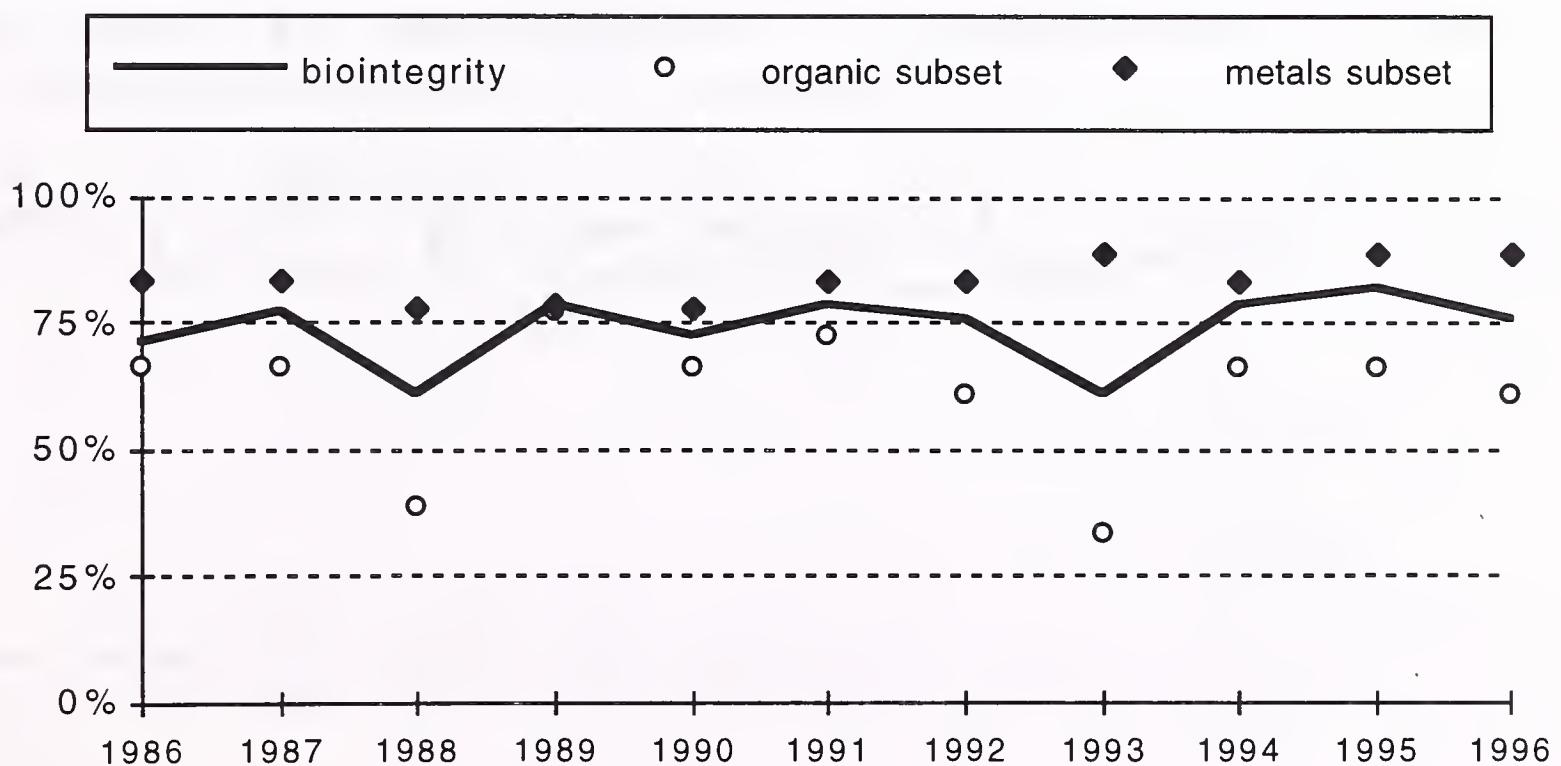


Figure 27. Biointegrity (%) in the Clark Fork River at Huson (station 22), 1986-1996.

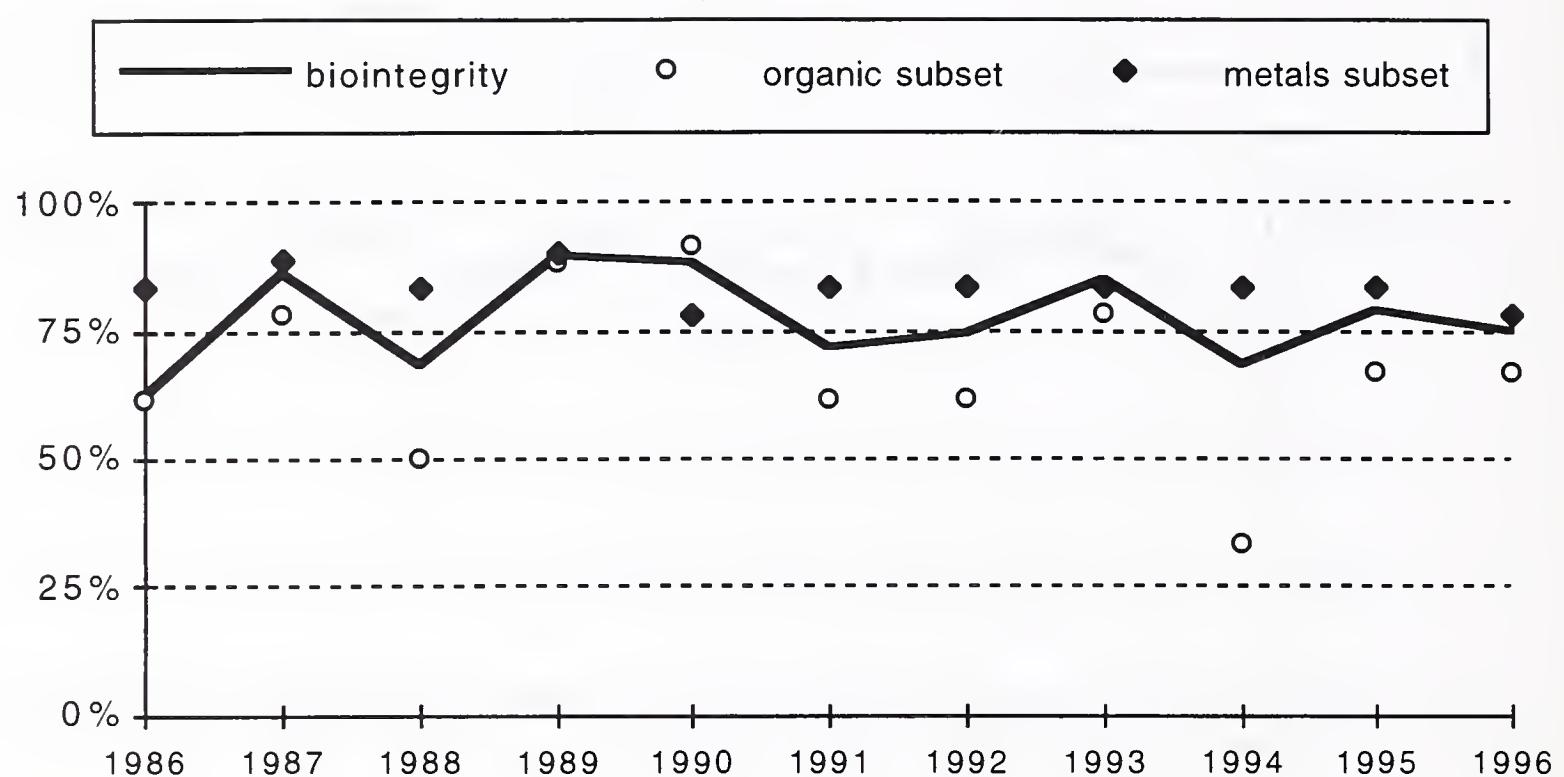


Figure 28. Biointegrity (%) in the Clark Fork River at Superior (station 24), 1986-1996.

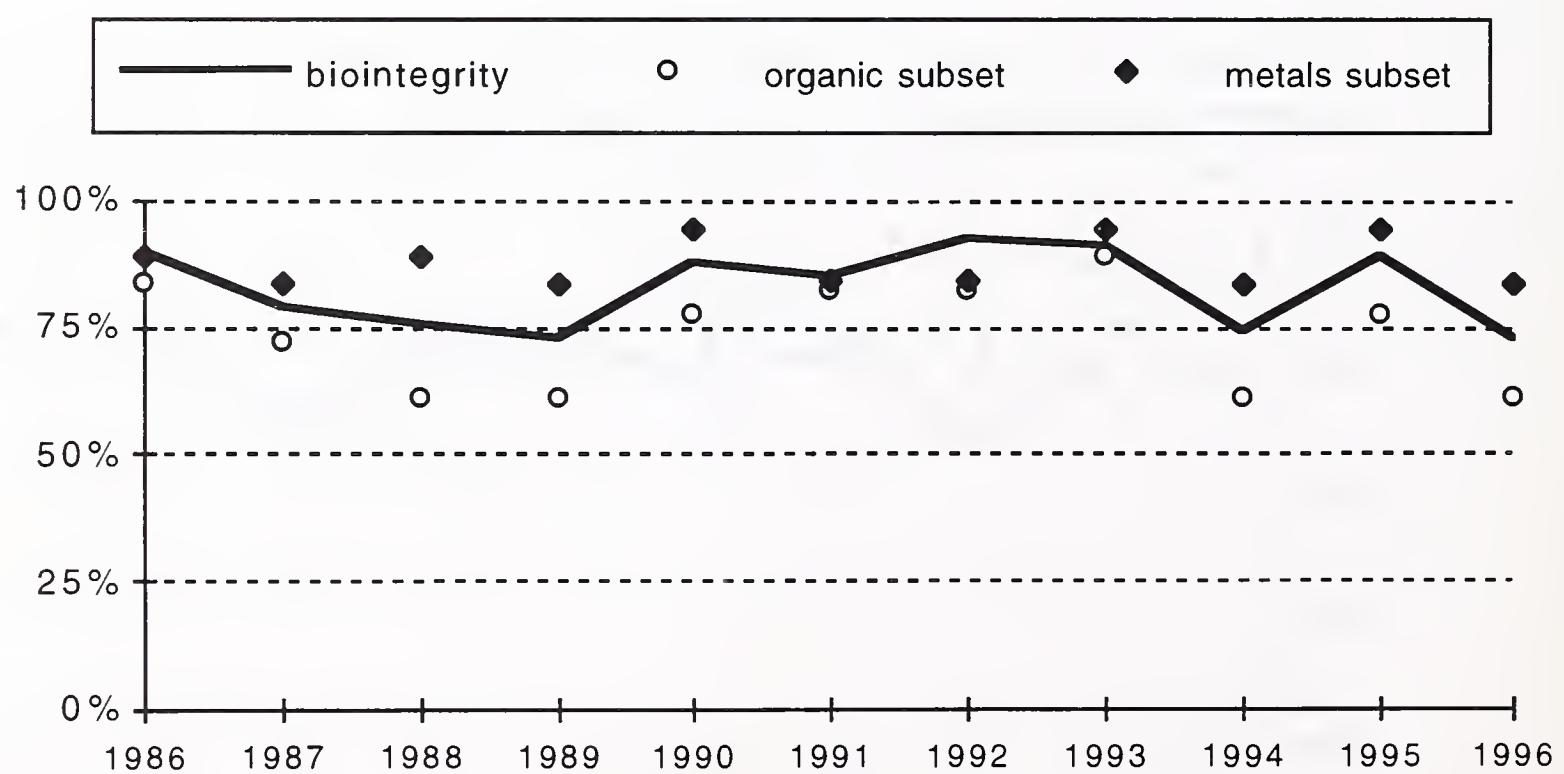


Figure 29. Biointegrity (%) in the Clark Fork River above the Flathead River (station 25), 1986-1996.

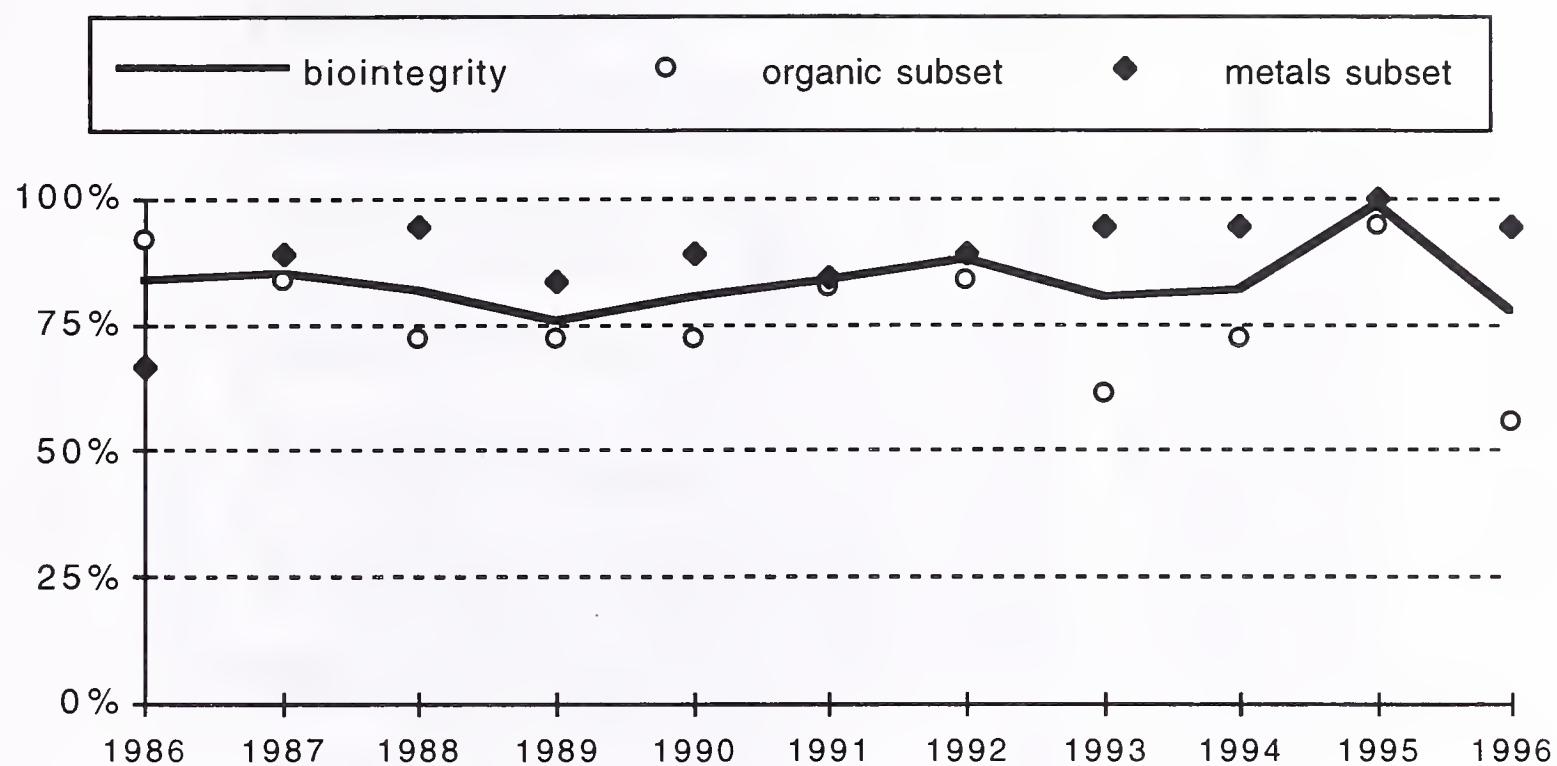


Figure 30. Biointegrity (%) in the Clark Fork River above Thompson Falls Reservoir (station 27), 1987-1995.

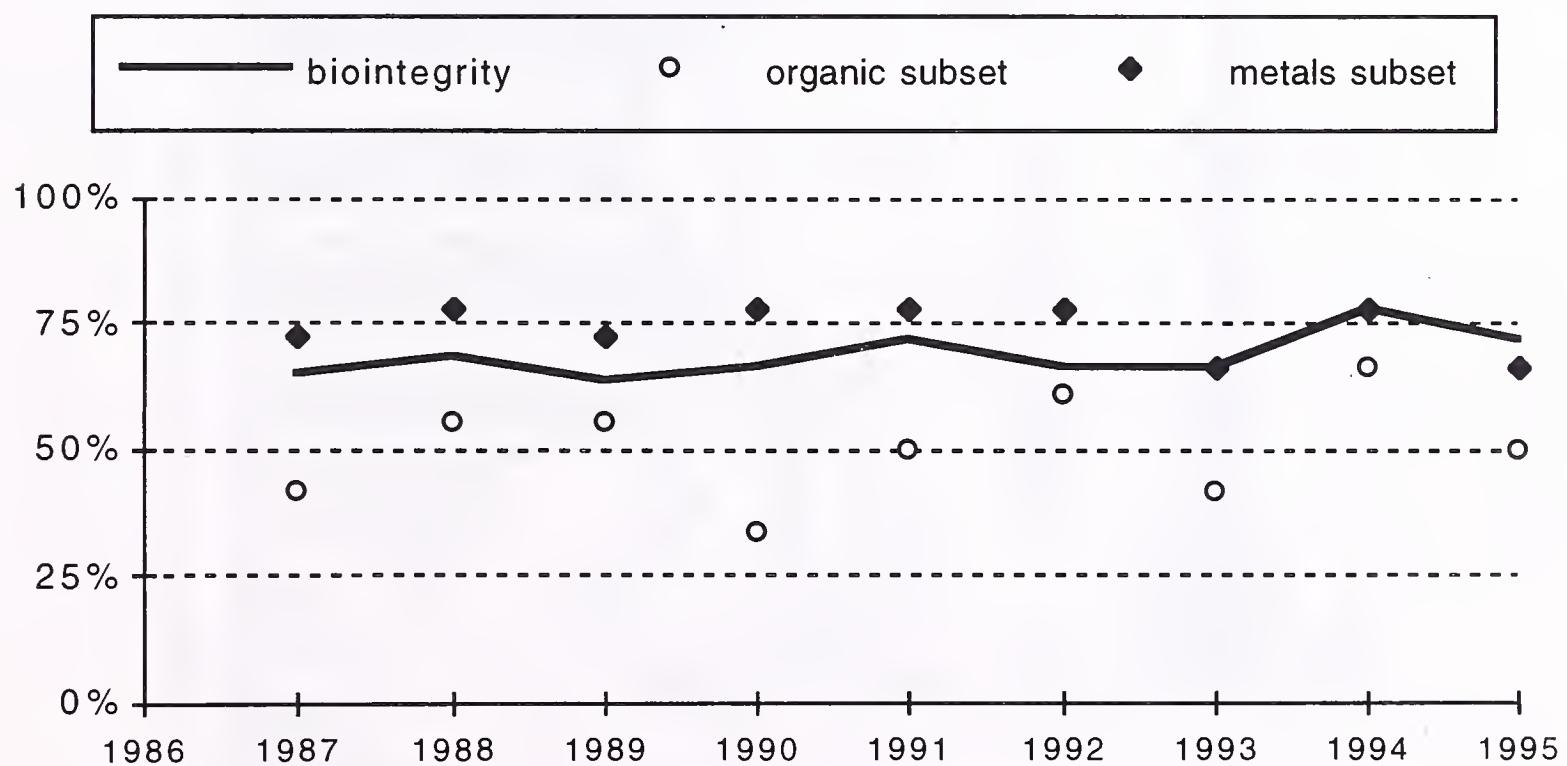


Figure 31. Mean biointegrity at 17 stations in the Clark Fork River Basin, 1986-1996.

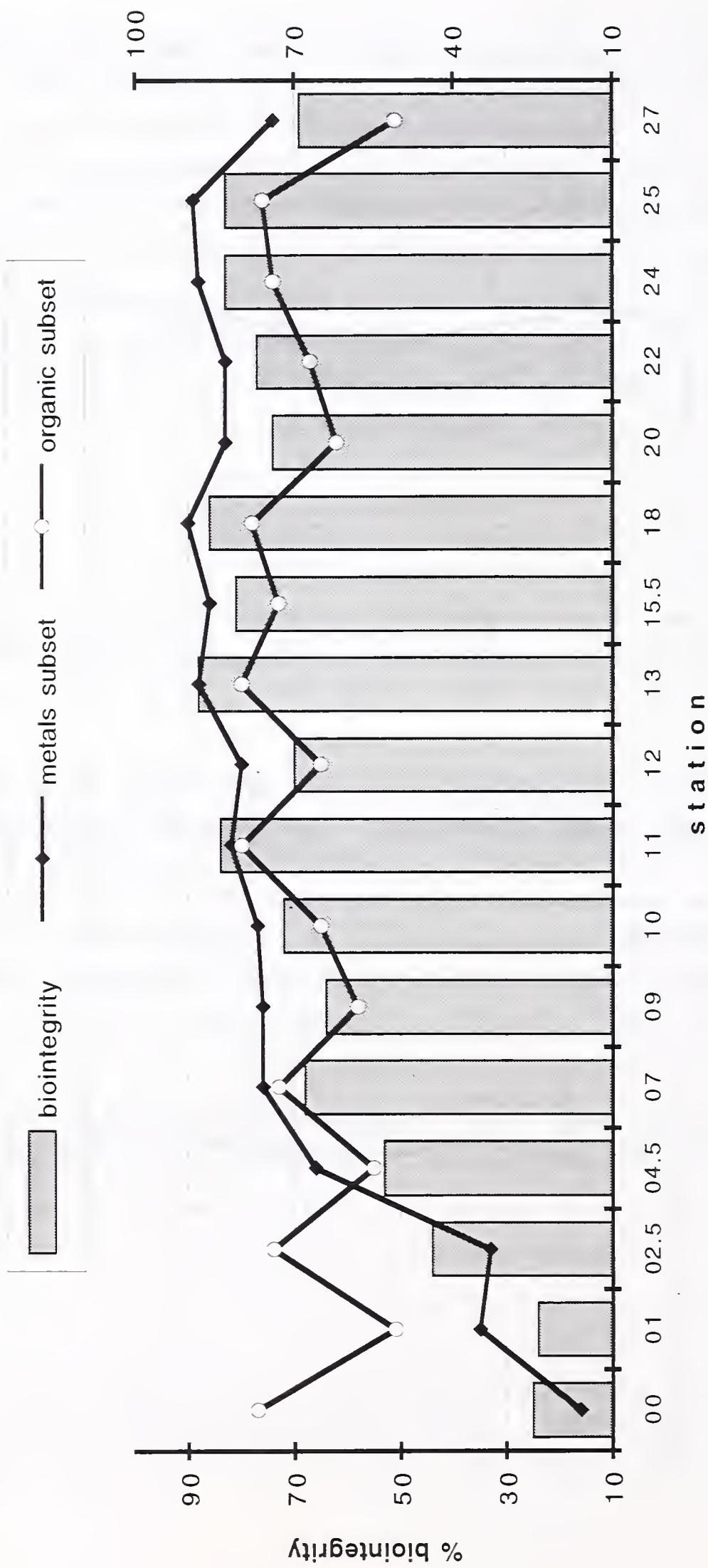


Figure 32. Density and frequency of occurrence of Tanytarsini midges at Clark River Basin monitoring stations (1986-1996).

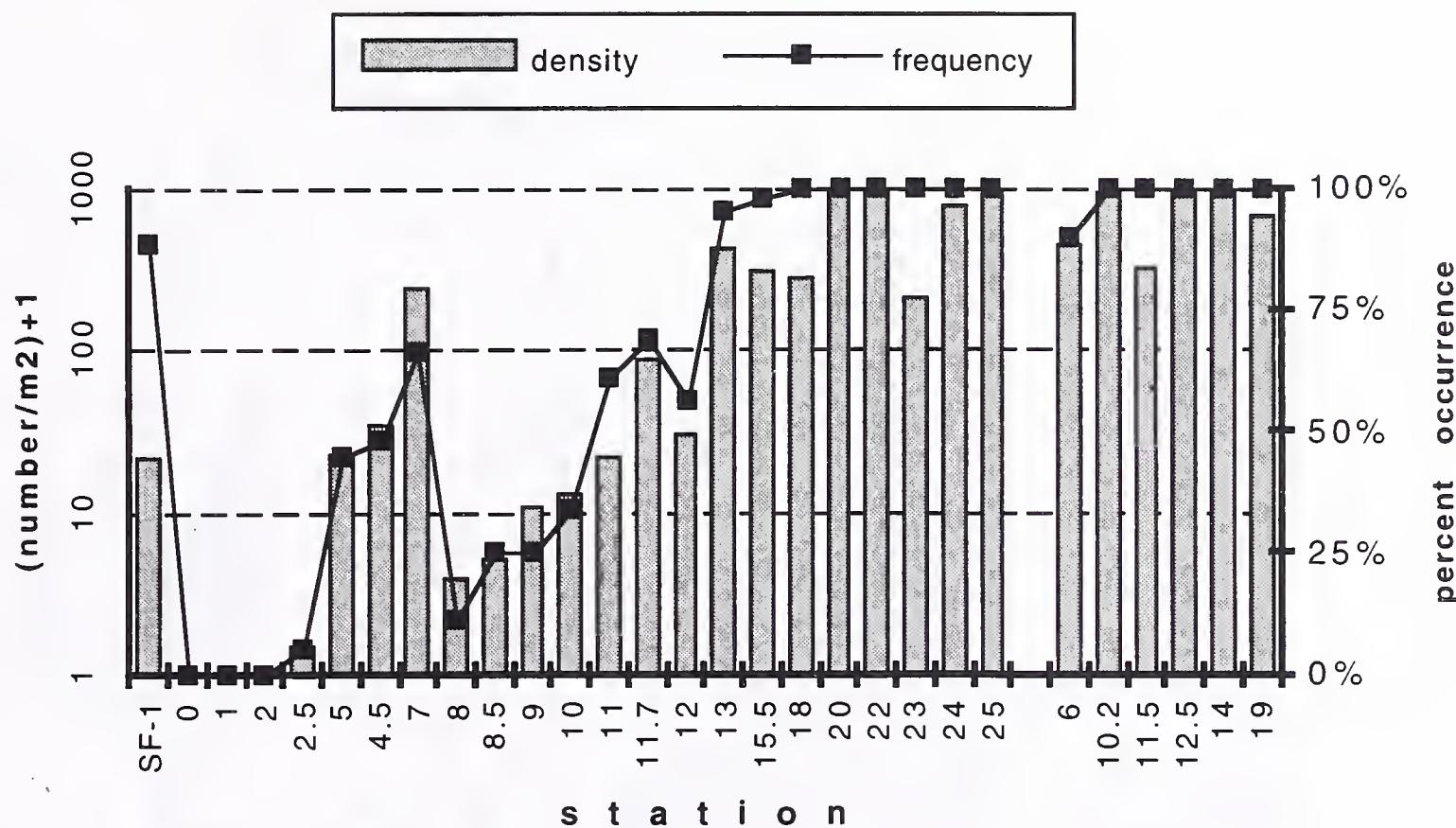


Figure 33. Density and frequency of occurrence of *Arctopsyche grandis* at Clark River Basin monitoring stations (1986-1996).

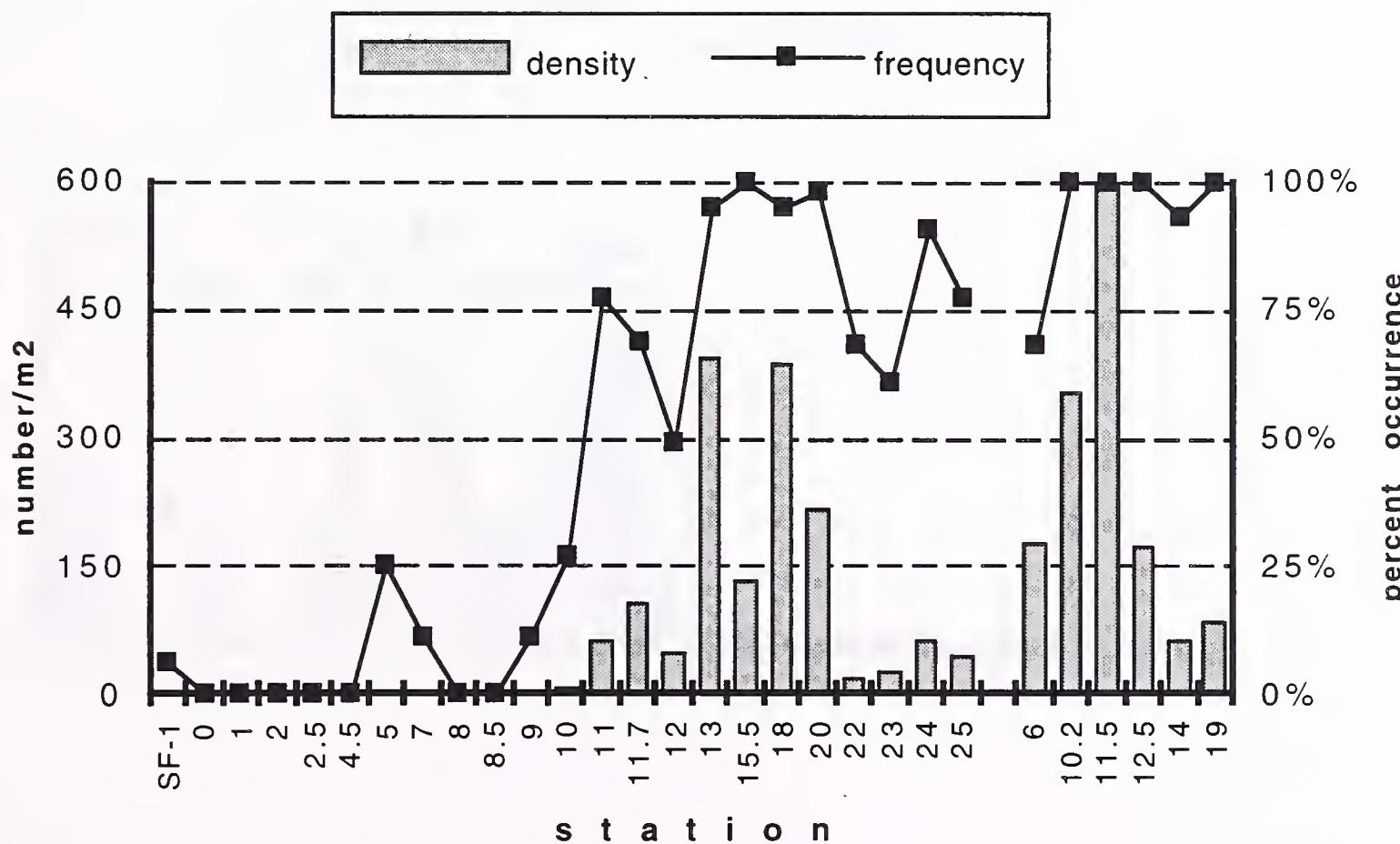


Figure 34. Density and frequency of occurrence of *Hesperoperla pacifica* at Clark River Basin monitoring stations (1986-1996).

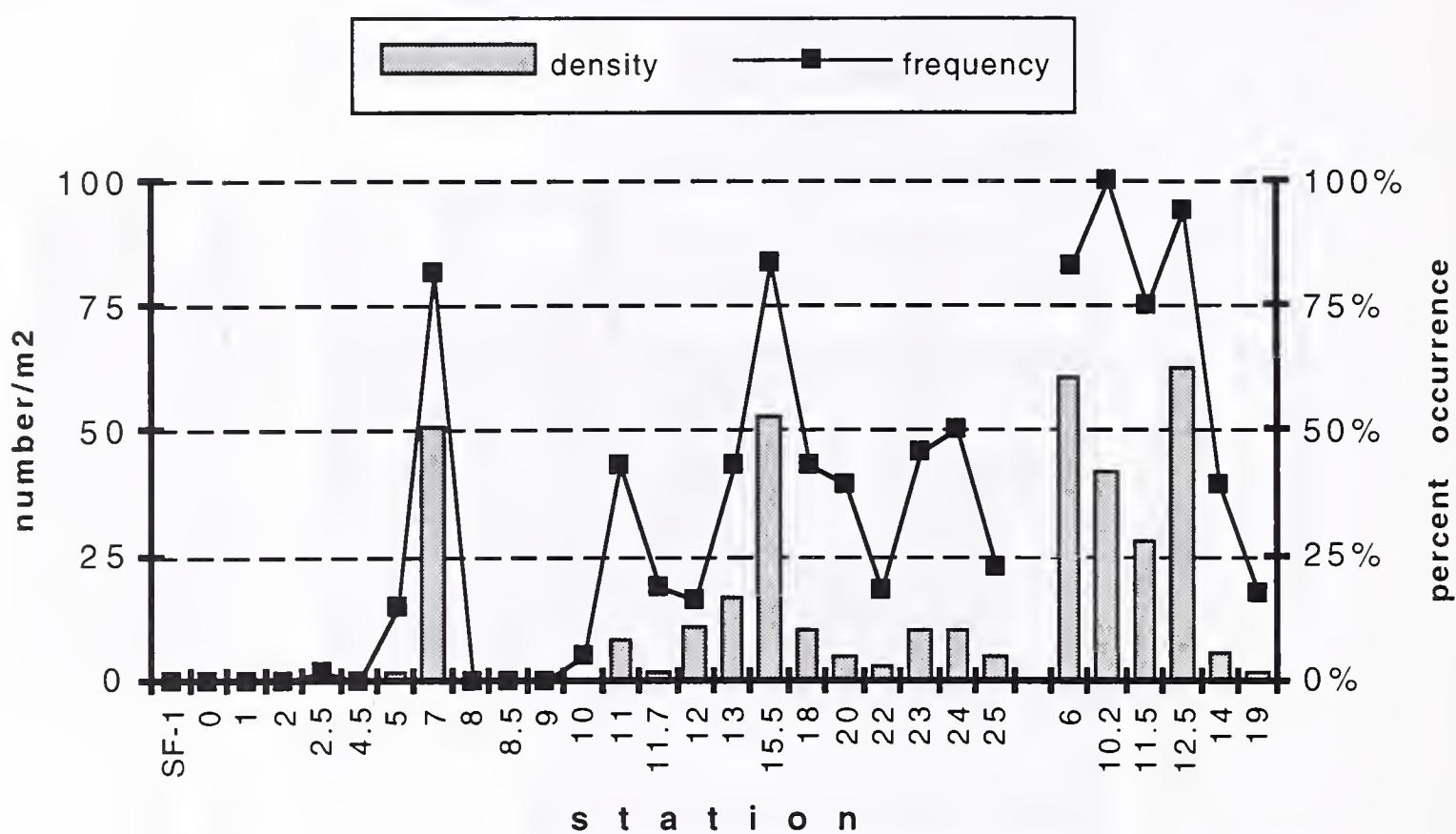


Figure 35. Density and frequency of occurrence of *Claassinia sabulosa* at Clark River Basin monitoring stations (1986-1996).

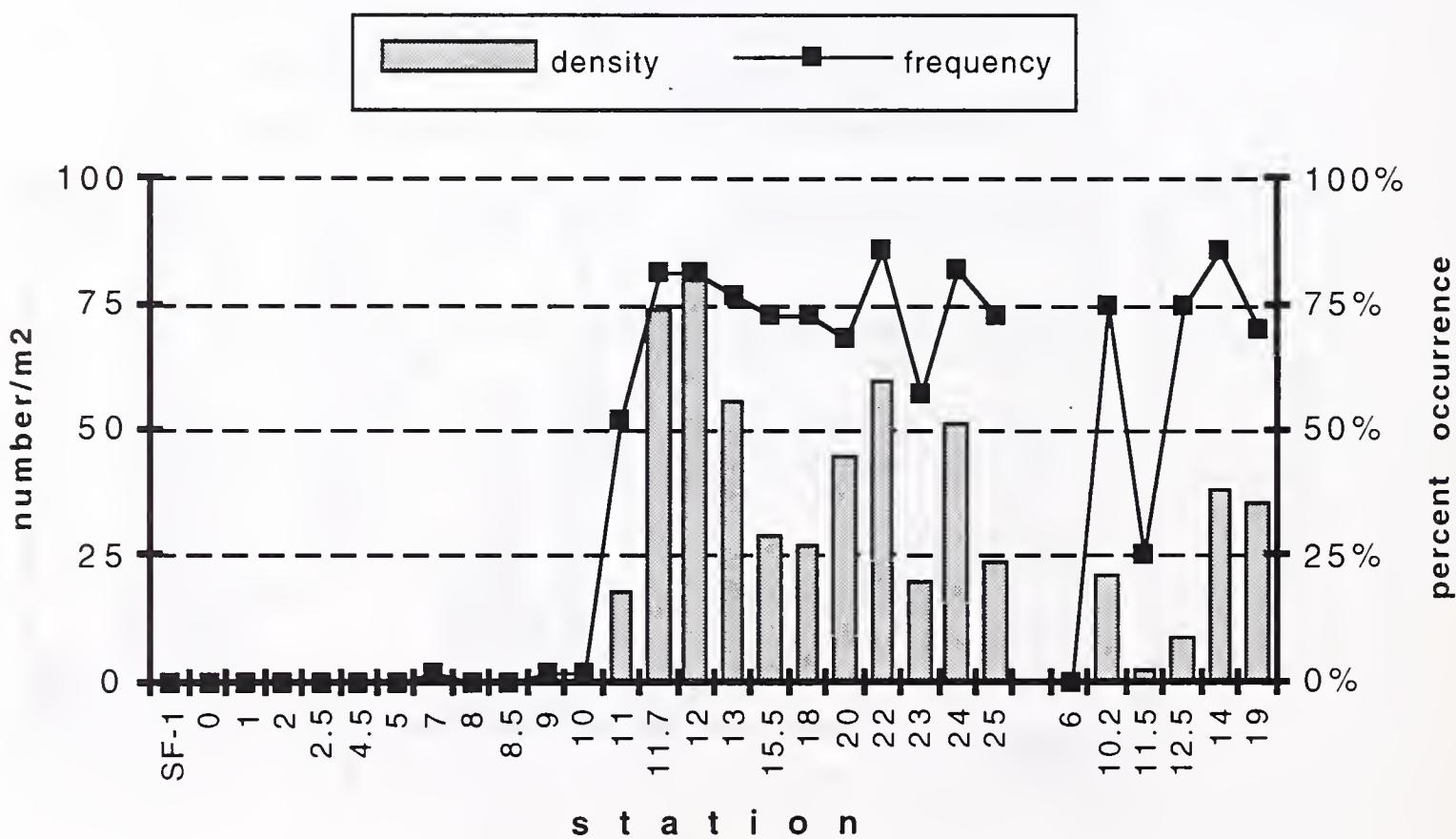
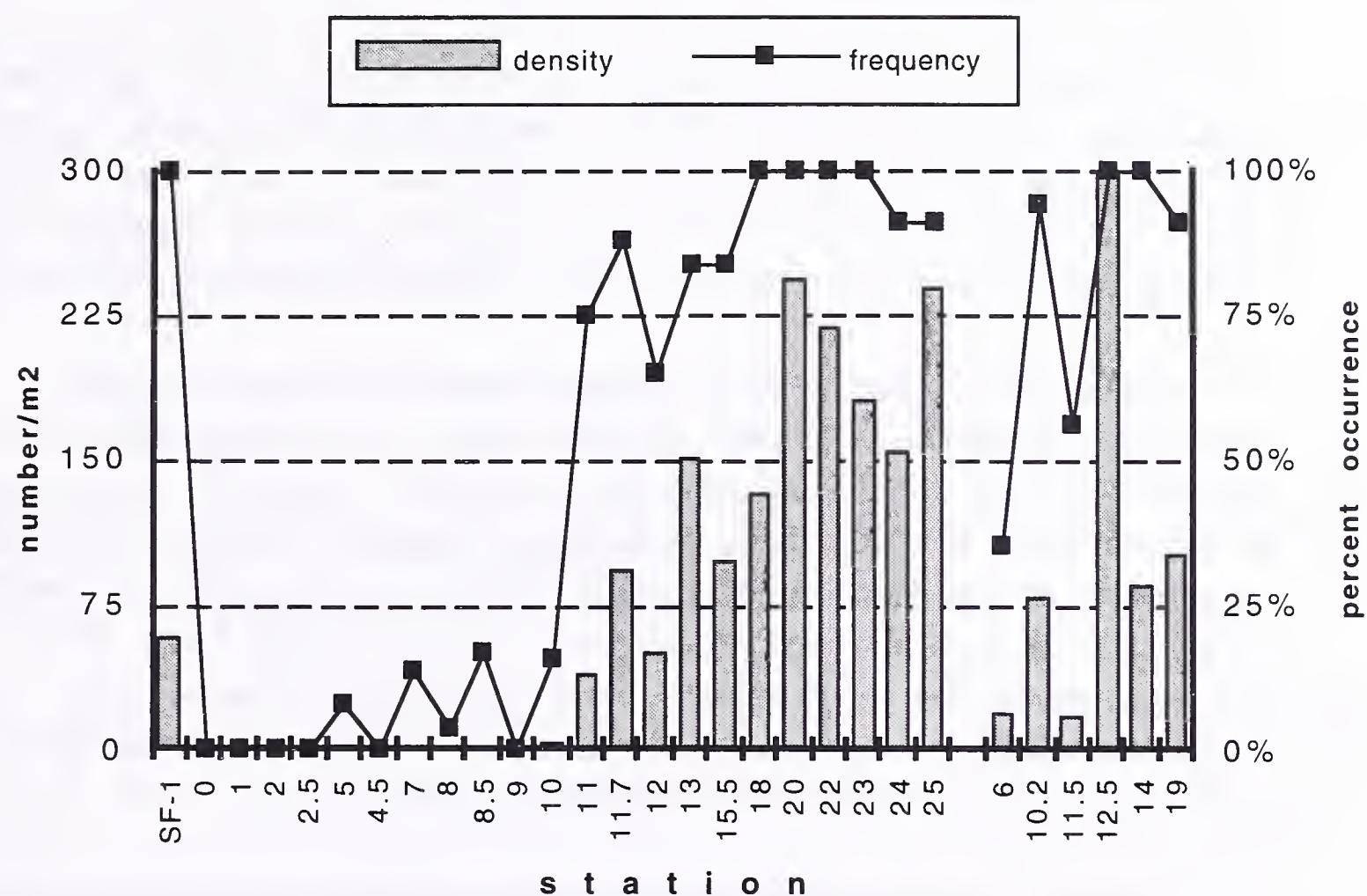


Figure 36. Density and frequency of occurrence of Heptageniidae mayflies at Clark River Basin monitoring stations (1986-1996).



5. CONCLUSIONS

5.1 1996 Monitoring

1. Macroinvertebrate-based bioassessments indicated no significant pollution at five Clark Fork River Basin sites during 1996. Biological integrity was unimpaired in the Clark Fork River at Turah and in the lower reaches of Warm Springs Creek, Little Blackfoot River, Rock Creek, and the Blackfoot River.
2. Continued widespread pollution was indicated in the remainder of the Clark Fork River Basin. Biointegrity was impaired at 20 of 25 monitoring stations. Impacts were severe in Silver Bow Creek above the Warm Springs Ponds. Moderate impacts were evident in Blacktail Creek, in Silver Bow Creek below the Warm Springs Ponds and in the Clark Fork River from Deer Lodge to the confluence of the Little Blackfoot River. Slight biological impairment was indicated in Flint Creek, the Bitterroot River and at 10 Clark Fork River stations.
3. Metals pollution was indicated at seven stations in 1996. Metals caused severe biological impairment in Silver Bow Creek above the Warm Springs Ponds. Slight impacts from metals were indicated in Blacktail Creek, in Silver Bow Creek below the Warm Springs Ponds, and in the Clark Fork River at Deer Lodge.
4. Nutrient and organic pollution were the principal cause of biological impairment in Flint Creek, the Bitterroot River, and at most Clark Fork River stations in 1996.
5. High stream flow and ice scour may have resulted in additional stresses on benthic communities in 1996. Biological integrity was slightly lower at most stations in 1996 than in 1995. Biointegrity declined between years at all Clark Fork stations except Turah and above Missoula. Flow and scour-related impacts were particularly evident downstream from Missoula.

5.2 Long-term Monitoring

1. Compared to 11-year means, biointegrity was slightly above average during 1996 in Silver Bow Creek, in Warm Springs Creek, and in the Clark Fork River immediately below Warm Springs Creek. Biointegrity was also slightly above average in the Clark Fork River from Turah to Missoula. However, biointegrity was slightly below average from Deer Lodge to Bonita in the upper river and at all Clark Fork River sites below Missoula.
2. Since 1986, biological integrity has improved slightly at seven stations in the upper basin. Significant trends of improving biointegrity were evident in Warm Springs Creek, the Blackfoot River, at three stations in Silver Bow Creek, and in the Clark Fork River below Warm Springs Creek and at Turah.
3. Improved biointegrity was primarily attributable to a slight, but widespread reduction in metals pollution. Trend analyses of scores for metals-sensitive metrics indicated diminished metals pollution at 13 stations. The annual mean score for Silver Bow Creek and for the three upstream reaches of the Clark Fork River (the Clark Fork from Warm Springs Creek to the Bitterroot River) also exhibited significant positive trends over time.
4. Community-based assessments continued to indicate slight metals impacts in the Clark Fork River from Deer Lodge to the Little Blackfoot River; however, metals pollution has not been indicated below the Little Blackfoot River since 1992 or downstream from Rock Creek since 1990.
5. Indicator taxa may provide a more sensitive measure of low levels and subtle changes in metals pollution than community-based assessments. Increased occurrence and abundance of intolerant taxa indicate reduced metals pollution in Warm Springs Creek and in the Clark Fork immediately below Warm Springs Creek and at stations downstream from the Little Blackfoot River. However, populations of metals-sensitive taxa were extremely low in the Clark Fork River from Deer Lodge to

the Little Blackfoot River and remained slightly depressed in the Clark Fork from the Little Blackfoot River to Rock Creek.

6. Upper Silver Bow Creek was severely impaired by metals, nutrients and organic pollutants throughout the 11-year monitoring period. Metals were clearly the most deleterious pollutants in this reach.
7. Biological integrity has improved, but remained moderately impaired, in Silver Bow Creek below the Warm Springs Ponds. Prior to 1993, monitoring at a different location indicated severe impairment below the ponds.
8. Lower Warm Springs Creek was nonimpaired in 1996. Since 1986, significant trends of reduced metals pollution and increased biological integrity were evident at this site.
9. Biointegrity has improved significantly at the upper-most station on the Clark Fork River. This site was moderately impaired from 1986 through 1992, but was only slight impairment has been evident since 1993. Metals pollution has been indicated only once since 1993.
10. Within the Clark Fork mainstem, the reach from Deer Lodge to the Little Blackfoot River has the lowest biological integrity. Moderate impairment in this reach was due to the combined effects of nutrient/organic and metals pollution.
11. Increased nutrient/organic pollution was usually evident in the Clark Fork River from the confluence of the Bitterroot River to Huson. Slight to moderate impacts were attributed to nutrients from the Missoula WWTP, the Bitterroot River, and the Stone Container Corporation Frenchtown kraft mill.
12. Based on 11 years of monitoring, the healthiest sites in the Clark Fork River include stations at the Gold Creek Bridge, Turah, Shuffield's, and the reach from Superior to the confluence of the Flathead River.

6. LITERATURE CITED

- Clements, W. H. 1991. Community responses of stream organisms to heavy metals: A review of observational and experimental approaches. *In:* Newman M. and A. McIntosh (eds.). Metal Ecotoxicology: Concepts and Applications. Lewis Publishers.
- Clements, W. H., D. S. Cherry and J. Cairns. 1988. Impact of heavy metals on insect communities in streams: A comparison of observational and experimental results. *Can. J. Aquat. Sci.* 45:2017-2025.
- Harris, T.L. and T.M. Lawrence. 1978. Environmental requirements and pollution tolerance of Trichoptera. EPA-600/4-78-061. United States Environmental Protection Agency
- Hilsenhoff, W. L. 1987. An improved biotic index of organic stream pollution. *Great Lakes Entomologist.* 20:31-39.
- Hubbard, M.D. and W.L. Peters. 1978. Environmental requirements and pollution tolerance of Ephemeroptera. EPA-600/4-78-061. United States Environmental Protection Agency.
- Ingman G. L. (ed.). 1985. Champion International Frenchtown Mill Discharge Permit. MT-0000035 - Vol. II. Montana Dept. of Health and Environmental Sciences, Water quality Bureau.
- Ingman, G. L. and M. A. Kerr. 1989. Water Quality in the Clark Fork River Basin, Montana: State fiscal years 1988-1989. Montana Dept. of Health & Environmental Sciences, Water Quality Bureau.
- Ingman, G. L., M. A. Kerr and D.L. McGuire. 1990. Water quality investigations in the Blackfoot River Drainage, Montana: Montana Dept. of Health & Environmental Sciences, Water Quality Bureau.
- Karr, J. R. and D. R. Dudley. 1981. Ecological perspective on water quality goals. *Environ. Manage.* 11:249-256.

Leland, H. V., S. V. Fend, T. L. Dudley, and J. L. Carter. 1989. Effects of copper on species composition of benthic insects in a Serria Nevada, California, stream. *Freshwater Biol.* 21:361-365.

Lynch, T. R., C. J. Popp, and G. Z. Jacobi. 1988. Aquatic insects as environmental monitors of trace metal contamination: Red River, New Mexico. *Water Air Soil Pollution.* 42: 19-31.

McGuire, D. L. 1997. Clark Fork River macroinvertebrate community biointegrity, 1995 assessment. Technical report prepared for the Montana Department of Environmental Quality/ Planning, Prevention and Assistance Division.

McGuire, D. L. 1996a. Clark Fork River macroinvertebrate community biointegrity, 1994 assessment. Technical report prepared for the Montana Department of Environmental Quality/ Water Quality Division.

McGuire, D. L. 1996b. Macroinvertebrate community biointegrity in Warm Springs, Mill, and Willow Creeks: Anaconda NPL Site. Technical report prepared for U.S. EPA, Region VIII, Montana Office.

McGuire, D. L. 1995. Clark Fork River macroinvertebrate community biointegrity, 1993 assessment. Technical report prepared for the Montana Department of Health and Environmental Sciences/Water Quality Division.

McGuire, D. L. 1993. Clark Fork River macroinvertebrate community biointegrity, 1986 through 1992. Technical report prepared for the Montana Department of Health and Environmental Sciences/Water Quality Bureau.

McGuire, D. L. 1992. Montana Reference streams project: 1991 aquatic macroinvertebrate surveys. Technical report prepared for the Montana Department of Health and Environmental Sciences/Water Quality Bureau.

McGuire, D. L. 1990a. Aquatic macroinvertebrate surveys in the Clark Fork River, 1986 to 1988. In: V. Watson (ed.). *Clark Fork River Symposium Proceedings.* Mont. Acad. Sci. Missoula MT.

- McGuire, D. L. 1990b. Aquatic macroinvertebrate survey of the Blackfoot River, Montana: August, 1988 and 1989. Technical report prepared for the Montana Department of Health and Environmental Sciences/Water Quality Bureau.
- McGuire, D. L. 1989a. Clark Fork River aquatic macroinvertebrate survey, August, 1987. Technical report prepared for the Montana Department of Health and Environmental Sciences/Water Quality Bureau.
- McGuire, D. L. 1989b. Clark Fork River aquatic macroinvertebrate survey, August, 1988. Technical report prepared for the Montana Department of Health and Environmental Sciences/Water Quality Bureau.
- McGuire, D. L. 1987. Clark Fork River macroinvertebrate study, 1986. Technical report prepared for the Montana Governor's Office and Montana Water Quality Bureau.
- McGuire, D. L. and G.L. Ingman 1996. Clark Fork River macroinvertebrate community biointegrity, 1994 assessment. Technical report prepared for the Montana Department of Environmental Quality.
- Merritt, R. W. and K.W. Cummins. 1984. An introduction to the aquatic insects of North America. 2nd Ed. Kendall/Hunt Publishing Co. Dubuque, Iowa.
- Meyer, J. L. 1997. Stream health: incorporating the human dimension to advance stream ecology. Journal of the North American Benthological Society 16:439-447.
- Montana Dept. of Environmental Quality. 1996. Field Procedure Manual: collection, analysis and reporting of water quality samples. Water Quality Division.
- MultiTech and OEA Research. 1986. Silver Bow Creek remedial investigation, Appendix E - macroinvertebrate investigation. Montana Dept. of Health and Environmental Sciences.

- Plafkin, J. L., M. T. Barbour, K. D. Porter, S. K. Gross, and R. M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: benthic macroinvertebrates and fish. U.S. EPA/444/4-89-001.
- Rolin, R. A. 1988. The effects of heavy metal pollution of the upper Arkansas River on the distribution of aquatic macroinvertebrates. *Hydrobiologia* 160:3-8.
- Spindler, J. C. 1959. An extensive chemical, physical, bacteriological, and biological survey - Columbia River Drainage in Montana. Water Pollution Control Report No. 59-1, Montana State Board of Health.
- Weber, C. I. (ed). 1973. Biological field and laboratory methods for measuring the quality of surface waters and effluents. U. S. EPA. Cincinnati, OH. (670/4-73-001).
- Wiederholm, T. 1984. Responses of aquatic insects to environmental pollution. In. Resh, V. H. and D. M. Rosenberg (eds.). *The Ecology of Aquatic Insects*. Praeger Publ. New York.
- Winner, R. W., M. W. Boessel and M. P. Farrel. 1980. Insect community structure as an index of heavy-metal pollution in lotic ecosystems. *Can. J. Fish. Aq. Sci.* 37:647-55.
- Yasuno, M., S. Hataeyama and Y. Sugaya. 1985. Characteristic distribution of chironomids in rivers polluted with heavy metals. *Verh. Int. Ver. Limnol.* 22:2371-2377.
- Zar, J. H. 1974. Biostatistical analysis. Prentice-Hall, Inc. NJ.

APPENDIX A:

Macroinvertebrate checklist for the Clark Fork Basin
with biotic and metals tolerance values

Appendix A. Aquatic macroinvertebrates collected from the Clark Fork River Basin during August, 1986-1996 and tolerance values used to calculate biotic and metals tolerance indices.

class	order	family	genus	species	biotic index	metals tolerance
INSECTA						
Coleoptera		Dytiscidae				7
			<i>Agabetes</i>	<i>sp.</i>		
			<i>Agabinus</i>	<i>sp.</i>		
			<i>Agabus</i>	<i>sp.</i>		
			<i>Deronectes</i>	<i>sp.</i>		
			<i>Hydroprus</i>	<i>sp.</i>		
			<i>Hydrovatus</i>	<i>sp.</i>		
			<i>Hygrotus</i>	<i>sp.</i>		
			<i>Ilybius</i>	<i>sp.</i>		
			<i>Oreodytes</i>	<i>spp.</i>		
Elmidae						
			<i>Cleptelmis</i>	<i>ornata</i>	4	4
			<i>Dubiraphia</i>	<i>sp.</i>	6	4
			<i>Heterlimnius</i>	<i>corpulentus</i>	3	3
			<i>Lara</i>	<i>avara</i>	1	1
			<i>Microcylloepus</i>	<i>sp.</i>	5	4
			<i>Narpus</i>	<i>concolor</i>	2	1
			<i>Optioservus</i>	<i>spp.</i>	5	5
			<i>Ordobrevia</i>	<i>sp.</i>	5	3
			<i>Stenelmis</i>	<i>sp.</i>	5	3
			<i>Zaitzevia</i>	<i>parvula</i>	4	3
Haliplidae					5	7
			<i>Brychius</i>	<i>sp.</i>		
			<i>Haliplus</i>	<i>sp.</i>		
			<i>Peltodytes</i>	<i>sp.</i>		
Hydrophilidae						7
Plecoptera						
Capniidae					1	0
Chloroperlidae						
			<i>Chloroperlinae</i>		1	2
			<i>Kathroperla</i>	<i>perdita</i>	1	2
Nemouridae						
			<i>Amphinemura</i>	<i>sp.</i>	2	1
			<i>Zapada</i>	<i>cinctipes</i>	3	3
			<i>Zapada</i>	<i>oregenensis</i> gp.	2	2
			<i>Malenka</i>	<i>sp.</i>	1	1
Perlidae						
			<i>Calineuria</i>	<i>californica</i>	2	3
			<i>Claassenia</i>	<i>sabulosa</i>	3	3
			<i>Doroneuria</i>	<i>sp.</i>	1	3
			<i>Hesperoperla</i>	<i>pacifica</i>	1	3

Appendix A. continued.

class	order	family	genus	species	biotic index	metals tolerance
Perlodidae						
			<i>Cultus</i> sp.		2	2
			<i>Isoperla fulva</i>		2	3
			<i>Isoperla quinquepunctata</i>		2	2
			<i>Isogenoides</i> sp.		3	2
			<i>Skwala</i> sp.		3	3
Pteronarcidae						
			<i>Pteronarcella badia</i>		3	4
			<i>Pteronarcys californica</i>		2	1
			<i>Taeniopterygidae</i>		2	1
Diptera						
Chironomidae						
			Tanypodinae			
			<i>Ablabesmyia</i> sp.		8	3
			<i>Alotanypus</i> sp.		6	8
			<i>Brundiniella</i> sp.		3	7
			<i>Macropelopia</i> sp.		6	5
			<i>Thienemannimyia</i> gp.		5	3
			<i>Pentaneura</i> sp.		6	2
			<i>Procladius</i> sp.		9	5
			Diamesinae			
			<i>Diamesa</i> sp.		5	9
			<i>Pagastia</i> sp.		1	9
			<i>Potthastia gaedii</i> gp.		2	5
			<i>P. longimanus</i> gp.		2	5
			Prodiamesinae			
			<i>Monodiamesa</i> sp.		7	5
			<i>Odontomesa</i> sp.		4	5
			<i>Prodiamesa</i> sp.		3	3
			Orthocladinae			
			<i>Brillia</i> sp.		4	4
			<i>Cardiocladius</i> spp.		5	9
			<i>Corynoneura</i> sp.		7	4
			<i>Cricotopus</i> spp.		7	10
			<i>C. (Nostococladius)</i> sp.		6	5
			<i>Eukiefferiella</i> spp.		8	9
			<i>E. (devonica)</i> gp.		8	7
			<i>Nanocladius</i> sp.		3	4
			<i>Orthocladus</i> spp.		6	5
			<i>Parametriocnemus</i> sp.		5	4
			<i>Paraphaenocladius</i> sp.		4	4
			<i>Rheocricotopus</i> sp.		4	5
			<i>Symbiocladius</i> sp.		4	1
			<i>Synorthocladius</i> sp.		2	1
			<i>Tvetenia</i> sp.		5	4

Appendix A. continued.

class	order	family	genus	species	biotic index	metals tolerance
		Chironominae				
		Chironomini				
		<i>Chironomus</i> sp.			10	7
		<i>Cryptochironomus</i> sp.			8	5
		<i>Demicryptochironomus</i> sp.			8	4
		<i>Dicrotendipes</i> sp.			8	5
		<i>Endochironomus</i> sp.			10	6
		<i>Glyptotendipes</i> sp.			10	4
		<i>Microtendipes</i> sp.			6	4
		<i>Parachironomus</i> sp.			10	4
		<i>Paracladopelma</i> sp.			7	4
		<i>Phaenopsectra</i> sp.			7	4
		<i>Polypedilum</i> spp.			6	4
		<i>Psuedochironomus</i> sp.			5	4
		<i>Xenochironomus</i> sp.			4	0
		Tanytarsini				
		<i>Cladotanytarsus</i> sp.			7	3
		<i>Micropsectra</i> spp.			4	1
		<i>Paratanytarsus</i> sp.			6	3
		<i>Stempellina</i> sp.			2	0
		<i>Rheotanytarsus</i> sp.			6	1
		<i>Tanytarsus</i> sp.			6	3
		Tipulidae				
		<i>Antocha</i> sp.			3	4
		<i>Dicranota</i> sp.			3	2
		<i>Hesperoconpa</i> sp.			1	1
		<i>Hexatoma</i> sp.			2	2
		<i>Limnonia</i> (?) sp.			3	2
		<i>Ormosia</i> (?) sp.			6	3
		<i>Tipula</i> sp.			4	3
		Athericidae				
		<i>Atherix pachypus</i>			4	4
		Simuliidae				
		<i>Simulium (Eusimulium)</i> spp.			5	5
		<i>Simulium (Psilozoa)</i> sp.			7	7
		Empididae				
		<i>Chelifera</i> sp.			5	4
		<i>Clinocera</i> sp.			5	4
		<i>Hemerodromia</i> sp.			6	4
		Tanyteridae				
		<i>Protanyderus</i> sp.			5	1
		Muscidae				
		<i>Limnophora</i> sp.			6	7

Appendix A. continued.

class	order	family	genus	species	biotic index	metals tolerance
		Ceratopogonidae				
			Certatopogoninae		6	4
		Culicidae				
			<i>Aedes</i> sp.		7	5
		Dolichopodidae			4	4
		Tabanidae			6	3
		Stratiomyidae				
			<i>Euparyphus</i> sp.		7	4
		Psychodidae				
			<i>Pericoma</i> sp.		4	4
	Hemiptera					
		Corixidae				5
			<i>Hesperocorixa laevigata</i>			
			<i>Sigara</i> sp.			
		Saldidae				
			<i>Salda</i> sp.			
	Lepidoptera					
		Pyralidae				
			<i>Petrophila</i> sp.		5	3
	Megaloptera					
		Sialidae				
			<i>Sialis</i> sp.		4	4
	Odonata					
		Gomphidae				
			<i>Ophiogomphus</i> sp.		5	4
	Ephemeroptera					
		Baetidae				
			<i>Acentrella insignifcans</i>		4	4
			<i>A. turbida</i>		4	3
			<i>Baetis punctiventris (Psuedocloeon)</i>		6	3
			<i>B. tricaudatus</i>		4	5
			<i>Callibaetis</i> sp.		9	1
			<i>Centroptilum</i> sp.		2	1
			<i>Diphetor hageni</i>		5	1
		Ephemerellidae				
			<i>Attenella margarita</i>		3	1
			<i>Caudatella heterocaudata</i>		0	0
			<i>Drunella coloradensis</i>		0	0
			<i>D. doddsi</i>		1	0
			<i>D. flaviginea</i>		2	0
			<i>D. grandis</i>		2	1
			<i>Ephemerella inermis</i>		4	3
			<i>Serratella tibialis</i>		2	1
			<i>Timpanoga hecuba</i>		2	1

Appendix A. continued.

class	order	family	genus	species	biotic index	metals	tolerance
Heptageniidae							
			<i>Cinygmula</i> sp.		0	0	
			<i>Epeorus</i> spp.		2	0	
			<i>E. albertae</i>		2	0	
			<i>E. grandis</i>		0	0	
			<i>E. longimanus</i>		1	0	
			<i>Heptagenia soltari</i>		3	1	
			<i>Nixe</i> sp.		4	1	
			<i>Rhithrogena</i> sp.		0	2	
			<i>Stenonema (termintum)?</i>		4	1	
Leptophlebiidae							
			<i>Paraleptophlebia</i> spp.		1	1	
			<i>P. bicornuta</i>		2	1	
			<i>P. debilis</i>		1	1	
Siphlonuridae							
			<i>Ameletus</i> sp.		0	1	
Tricorythidae							
			<i>Tricorythodes minutus</i>		4	4	
Trichoptera							
Brachycentridae							
			<i>Brachycentrus americanus</i>		1	4	
			<i>Brachycentrus occidentalis</i>		2	3	
			<i>Micrasema bactro</i>		1	2	
Glossosomatidae							
			<i>Agapetus</i> sp.		0	2	
			<i>Glossosoma</i> sp.		0	2	
			<i>Protoptila</i> sp.		1	2	
Helicopsycidae							
			<i>Helicopsyche</i> sp.		3	3	
Hydropsychidae							
			<i>Arctopsyche grandis</i>		2	3	
			<i>Cheumatopsyche</i> spp.		5	5	
			<i>Hydropsyche</i> spp.		5	5	
			<i>H. (H.) occidentalis</i>		5	5	
			<i>H. (Ceratopsyche) spp.</i>		5	5	
			<i>H.(C.) cockerelli</i>		4	4	
			<i>H. (C.) morosa?</i>		6	5	
			<i>H. (C.) oslari</i>		3	6	
			<i>H. (C.) slossonae</i>		4	6	

Appendix A. continued.

class	order	family	genus	species	biotic index	metals tolerance
Hydroptilidae						
			<i>Allisotrichia</i> (<i>Rioptila</i> ?) <i>sp.</i>	6	2	
			<i>Hydroptila</i> <i>spp.</i>	6	4	
			<i>Leucotrichia pictipes</i>	2	1	
			<i>Neotrichia</i> <i>sp.</i>	2	2	
			<i>Ochrotrichia</i> <i>sp.</i>	4	3	
			<i>Oxyethira</i> <i>sp.</i>	3	2	
			<i>Zumatrixchia notosa</i>	3	1	
Lepidostomatidae						
			<i>Lepidostoma</i> <i>sp.</i>	1	1	
Leptoceridae						
			<i>Ceraclea</i> <i>sp.</i>	3	1	
			<i>Oecetis</i> <i>sp.</i>	8	3	
			<i>Nectopsyche</i> <i>sp.</i>	3	3	
			<i>Trianodes</i> <i>sp.</i>	6	1	
Limnephilidae						
			<i>Dicosmoecus</i> <i>sp.</i>	2	1	
			<i>Ecclisomyia</i> <i>sp.</i>	4	2	
			<i>Limnephilus</i> <i>sp.</i>	3	2	
			<i>Onocosmoecus</i> <i>sp.</i>	3	2	
			<i>Neophylax</i> <i>sp.</i>	3	2	
			<i>Psychoglypha</i> <i>sp.</i>	0	2	
Philopotamidae						
			<i>Wormaldia</i> <i>sp.</i>	0	1	
Polycentropididae						
			<i>Polycentropus</i> <i>sp.</i>	6	1	
Psychomyiidae						
			<i>Psychomyia</i> <i>sp.</i>	2	1	
Rhyacophilidae						
			<i>Rhyacophila angelita</i> gp.	0	1	
			<i>R. coloradensis</i> gp.	0	1	
			<i>R. brunnea</i> gp.	2	1	

Appendix A. concluded.

class	order	family	genus	species	biotic index	metals tolerance
ANNELIDA						
		Oligochaeta				
		Enchytraeidae			4	1
		Lumbricidae			4	1
		Lumbriculidae			4	1
		Naididae			8	5
		Tubificidae			10	6
		Hirudinea				
		Erpobdellidae			8	4
		Glossophoniidae			9	4
			<i>Glossiphonia complanata</i>		9	4
			<i>Helobdella stagnalis</i>		10	4
CRUSTACEA						
		Amphipoda				
		Gammaridae				
			<i>Gammarus</i> sp.		4	1
		Talitridae				
			<i>Hyalella azteca</i>		8	3
		Isopoda				
		Asellidae				
			<i>Caecidotea</i> sp. (<i>Asellus</i>)		8	5
		Decapoda				
		Astacidae				
			<i>Pacifasticus</i> sp.		6	3
MOLLUSCA						
		Gastropoda				
		Ancyclidae				
			<i>Ferrissia rivularis</i>		6	1
		Lymnaeidae				
			<i>Fossaria</i> spp.		6	3
			<i>Stagnicola</i> sp.		6	3
			<i>Fisherola nutalli</i>		3	1
		Physidae				
			<i>Physella</i> sp.		8	4
		Planorbidae				
			<i>Gyraulus</i> sp.		8	3
		Valvatidae				
			<i>Valvata humeralis</i>		3	1
		Pelecypoda				
		Sphaeriidae			8	3
TURBELLARIA						
NEMATODA						
NEMATOMORPHA						
ACARI						
CNIDARIA						
			<i>Hydra</i> sp.		8	3

APPENDIX B:
1996 Clark Fork Basin macroinvertebrate data

B.1 MACROINVERTEBRATE DATA								
BLACKTAIL CREEK above Grove Gulch - STATION SF-1 - 27 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						7%	75	
<i>Optioservus spp.</i>	33	42	46	60	181	4%	45.3	11.2
<i>Zaitzevia sp.</i>	9	7	19	6	41	1%	10.3	6.0
<i>Cleptelmis ornata</i>	13	11	15	22	61	1%	15.3	4.8
<i>Narpus concolor</i>	0	1	0	1	2	0%	0.5	0.6
<i>Brychius sp.</i>	1	3	0	10	14	0%	3.5	4.5
DIPTERA						29%	333	
<i>Pagastia sp</i>	46	54	64	121	285	6%	71.3	34.0
<i>Cardiocladius spp.</i>	13	1	5	6	25	1%	6.3	5.0
<i>Cricotopus spp.</i>	6	1	1	26	34	1%	8.5	11.9
<i>Eukiefferiella spp.</i>	1	0	3	6	10	0%	2.5	2.6
<i>Eukiefferiella devonica gp.</i>	3	0	0	3	6	0%	1.5	1.7
<i>Orthocladius spp.</i>	7	7	6	99	119	3%	29.8	46.2
<i>Parametriocnemus sp.</i>	0	1	0	5	6	0%	1.5	2.4
<i>Tvetenia sp.</i>	0	1	5	16	22	0%	5.5	7.3
<i>Micropsectra spp.</i>	0	1	1	0	2	0%	0.5	0.6
<i>Antocha sp.</i>	1	0	0	0	1	0%	0.3	0.5
<i>Dicranota sp.</i>	1	3	4	0	8	0%	2.0	1.8
<i>Hexatoma sp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Limonia sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Simulium (Psilozoa)</i>	268	78	154	311	811	18%	202.8	106.3
<i>Limnophora sp.</i>	0	0	0	1	1	0%	0.3	0.5
EPHEMEROPTERA						12%	142	
<i>Baetis tricaudatus</i>	118	97	152	145	512	11%	128.0	25.3
<i>Diphetor hageni</i>	2	8	6	5	21	0%	5.3	2.5
<i>Drunella grandis</i>	0	0	1	0	1	0%	0.3	0.5
<i>Heptagenia sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Nixe sp.</i>	2	22	2	7	33	1%	8.3	9.5
PLECOPTERA						4%	42	
<i>Malenka sp.</i>	0	5	3	1	9	0%	2.3	2.2
<i>Isoperla quinquepunctata</i>	0	1	0	0	1	0%	0.3	0.5
<i>Pteronarcella badia</i>	21	26	46	56	149	3%	37.3	16.5
<i>Chloroperlinae</i>	1	1	3	3	8	0%	2.0	1.2

B.1 MACROINVERTEBRATE DATA								
BLACKTAIL CREEK above Grove Gulch - STATION SF-1 - 27 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TRICHOPTERA						48%	554	
<i>Cheumatopsyche</i> spp.	0	3	1	16	20	0%	5.0	7.4
<i>Hydropsyche cockerelli</i>	0	1	0	0	1	0%	0.3	0.5
<i>Hydropsyche nr. morosa</i>	1	0	2	0	3	0%	0.8	1.0
<i>Hydropsyche oslari</i> ?	298	250	348	554	1450	32%	362.5	133.8
<i>Hydropsyche slossonae</i>	136	125	205	259	725	16%	181.3	62.8
<i>Hydroptila</i> spp.	1	0	0	0	1	0%	0.3	0.5
<i>Lepidostoma</i> sp.	1	7	2	4	14	0%	3.5	2.6
<i>Glossosoma</i> sp.	0	0	0	1	1	0%	0.3	0.5
ANNELIDA						0%	1	
Lumbricidae	0	0	1	0	1	0%	0.3	0.5
Tubificidae	0	1	0	0	1	0%	0.3	0.5
MOLLUSCA						0%	1	
<i>Gyraulus</i> sp.	2	1	0	1	4	0%	1.0	0.8
ID's by D. McGuire								
TOTAL ORGANISMS	985	761	1096	1745	4587	1147	422	
TAXA RICHNESS	24	30	26	27	40	26.8	2.5	
SHAN. DIVERSITY	2.77	3.14	2.94	3.09	3.07	2.98	0.17	
BIOTIC INDEX	4.45	3.79	3.94	4.21	4.13	4.10	0.29	
EPT RICHNESS	10	13	12	11	17	11.5	1.3	
% R.A. DOMINANT	30%	33%	32%	32%	32%	32%	1.1%	
% R.A. FILTERERS	71%	60%	65%	65%	66%	65%	5%	
METALS TOLERANCE	6.19	5.68	5.93	6.05	5.99	5.96	0.22	
Baetidae/Ephemeroptera	0.98	0.82	0.98	0.96	0.94	0.94	0.08	
Hydropsychinae/Trichoptera	1.00	0.98	1.00	0.99	0.99	0.99	0.01	
EPT / (EPT + CHIR.)	0.88	0.89	0.90	0.79	0.85	0.87	0.05	

B.2 MACROINVERTEBRATE DATA								
SILVER BOW CREEK above Butte WWTP - STATION 00 - 28 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						2%	6	
<i>Optioservus spp.</i>	0	1	7	8	16	1%	4.0	4.1
<i>Zaitzevia sp.</i>	0	1	1	0	2	0%	0.5	0.6
<i>Cleptelmis ornata</i>	0	0	0	1	1	0%	0.3	0.5
<i>Agabus sp.</i>	0	0	0	2	2	0%	0.5	1.0
<i>Brychius sp.</i>	0	1	2	0	3	0%	0.8	1.0
DIPTERA						86%	314	
<i>Pagastia sp</i>	36	78	31	86	231	16%	57.8	28.3
<i>Cardiocladius spp.</i>	97	22	37	55	211	14%	52.8	32.4
<i>Cricotopus spp.</i>	211	210	114	221	756	52%	189.0	50.2
<i>Eukiefferiella spp.</i>	0	0	2	0	2	0%	0.5	1.0
<i>Orthocladius spp.</i>	12	6	2	5	25	2%	6.3	4.2
<i>Antocha sp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Tipula sp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Simulium (Psilozoa)</i>	0	1	2	1	4	0%	1.0	0.8
<i>Limnophora sp.</i>	2	2	9	11	24	2%	6.0	4.7
<i>Chelifera sp.</i>	1	1	0	0	2	0%	0.5	0.6
EPHEMEROPTERA						0%	0	
<i>Baetis tricaudatus</i>	0	0	1	0	1	0%	0.3	0.5
PLECOPTERA						0%	1	
<i>Pteronarcella badia</i>	0	0	3	0	3	0%	0.8	1.5
TRICHOPTERA						12%	45	
<i>Cheumatopsyche spp.</i>	1	0	0	1	2	0%	0.5	0.6
<i>Hydropsyche oslari ?</i>	11	27	60	58	156	11%	39.0	24.0
<i>Hydropsyche slossonae</i>	3	1	8	11	23	2%	5.8	4.6
ID's by D. McGuire								
TOTAL ORGANISMS	374	351	279	462	1466		367	75
TAXA RICHNESS	9	12	14	14	20		12.3	2.4
SHAN. DIVERSITY	1.75	1.75	2.52	2.26	2.18		2.07	0.38
BIOTIC INDEX	5.72	5.18	4.96	4.97	5.21		5.21	0.36
EPT RICHNESS	3	2	4	3	5		3.0	0.8
% R.A. DOMINANT	56%	60%	41%	48%	52%		51%	8.6%
% R.A. FILTERERS	4%	8%	25%	15%	13%		13%	9%
METALS TOLERANCE	9.26	9.21	8.37	8.80	8.93		8.91	0.42
Baetidae/Ephemeroptera	1.00	1.00	1.00	1.00	1.00		1.00	0.00
Hydropsychinae/Trichopter	1.00	1.00	1.00	1.00	1.00		1.00	0.00
EPT / (EPT + CHIR.)	0.04	0.08	0.28	0.16	0.13		0.14	0.11

B.3 MACROINVERTEBRATE DATA
 SILVER BOW CREEK below Colorado Tailings - STATION 01 - 27 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						0%	1	
<i>Agabus sp.</i>	1	0	0	0	1	0%	0.3	0.5
<i>Gyrinus sp.</i>	0	0	1	0	1	0%	0.3	0.5
DIPTERA						100%	1586	
<i>Pagastia sp</i>	6	34	6	0	46	1%	11.5	15.3
<i>Cardiocladus spp.</i>	26	5	45	8	84	1%	21.0	18.5
<i>Cricotopus spp.</i>	713	605	457	502	2277	36%	569.3	114.1
<i>Eukiefferiella spp.</i>	3	5	5	1	14	0%	3.5	1.9
<i>Orthocladius spp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Chironomus sp.</i>	0	1	0	1	2	0%	0.5	0.6
<i>Phaenopsectra sp</i>	1	2	0	0	3	0%	0.8	1.0
<i>Dicranota sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Tipula sp.</i>	0	5	0	0	5	0%	1.3	2.5
<i>Ceratopogoninae</i>	1	0	0	0	1	0%	0.3	0.5
<i>Simulium (Psilozoa)</i>	1535	1031	1103	227	3896	61%	974.0	545.5
<i>Limnophora sp.</i>	1	8	1	2	12	0%	3.0	3.4
TRICHOPTERA						0%	0	
<i>Hydropsyche oslari ?</i>	0	0	0	1	1	0%	0.3	0.5
ANNELIDA						0%	2	
Tubificidae	6	0	1	0	7	0%	1.8	2.9
MEGALOPTERA								
<i>Sialis sp.</i>	0	1	0	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	2293	1698	1620	742	6353		1588	639
TAXA RICHNESS	10	11	9	7	17		9.3	1.7
SHAN. DIVERSITY	1.06	1.22	1.12	1.04	1.18		1.11	0.08
BIOTIC INDEX	6.97	6.86	6.92	6.98	6.93		6.93	0.05
EPT RICHNESS	0	0	0	1	1		0.3	0.5
% R.A. DOMINANT	67%	61%	68%	68%	61%		66%	3.5%
% R.A. FILTERERS	67%	61%	68%	31%	61%		57%	18%
METALS TOLERANCE	7.96	8.10	7.91	9.05	8.11		8.26	0.54
Baetidae/Ephemeroptera	1.00	1.00	1.00	1.00	1.00		1.00	0.00
Hydropsychinae/Trichoptera	1.00	1.00	1.00	1.00	1.00		1.00	0.00
EPT / (EPT + CHIR.)	0.00	0.00	0.00	0.00	0.00		0.00	0.00

B.4 M

MACROINVERTEBRATE DATA

SILVER BOW CREEK at Opportunity - STATION 02.5 - 26 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						3%	10	
<i>Optioservus</i> spp.	5	7	13	8	33	3%	8.3	3.4
<i>Zaitzevia</i> sp.	0	0	1	1	2	0%	0.5	0.6
<i>Cleptelmis ornata</i>	1	0	0	0	1	0%	0.3	0.5
<i>Lara</i> sp.	1	0	0	0	1	0%	0.3	0.5
<i>Oreodytes</i> spp.	1	0	1	1	3	0%	0.8	0.5
DIPTERA						31%	101	
<i>Thienemannimyia</i> gp.	2	0	0	0	2	0%	0.5	1.0
<i>Pagastia</i> sp	17	23	35	35	110	9%	27.5	9.0
<i>Cardiocladius</i> spp.	48	41	45	109	243	19%	60.8	32.3
<i>Cricotopus</i> spp.	2	2	1	0	5	0%	1.3	1.0
<i>Eukiefferiella</i> spp.	2	2	1	4	9	1%	2.3	1.3
<i>Eukiefferiella devonica</i> gp.	5	2	4	1	12	1%	3.0	1.8
<i>Orthocladius</i> spp.	5	2	4	1	12	1%	3.0	1.8
<i>Paracladopelma</i> sp.	0	1	0	0	1	0%	0.3	0.5
<i>Antocha</i> sp.	2	1	0	0	3	0%	0.8	1.0
<i>Tipula</i> sp.	0	0	1	1	2	0%	0.5	0.6
<i>Atherix pachypus</i>	0	0	0	1	1	0%	0.3	0.5
<i>Simulium</i> (<i>Psilozoa</i>)	0	1	1	1	3	0%	0.8	0.5
EPHEMEROPTERA						0%	2	
<i>Baetis tricaudatus</i>	0	1	0	4	5	0%	1.3	1.9
<i>Rhithrogena</i> sp.	0	0	0	1	1	0%	0.3	0.5
PLECOPTERA						1%	2	
<i>Doroneuria</i> sp.	0	0	1	0	1	0%	0.3	0.5
<i>Hesperoperla pacifica</i>	0	0	0	1	1	0%	0.3	0.5
<i>Skwala</i> sp.	1	1	0	2	4	0%	1.0	0.8
<i>Pteronarcella badia</i>	0	1	0	0	1	0%	0.3	0.5
TRICHOPTERA						65%	207	
<i>Cheumatopsyche</i> spp.	4	1	3	0	8	1%	2.0	1.8
<i>Hydropsyche cockerelli</i>	6	5	3	3	17	1%	4.3	1.5
<i>Hydropsyche nr. morosa</i>	27	4	37	45	113	9%	28.3	17.8
<i>Hydropsyche oslari</i> ?	133	60	208	270	671	52%	167.8	91.1
<i>Hydropsyche slossonae</i>	1	1	3	1	6	0%	1.5	1.0
<i>Ochrotrichia</i> sp.	0	1	0	0	1	0%	0.3	0.5
<i>Brachycentrus americanus</i>	0	0	8	4	12	1%	3.0	3.8
<i>Rhyacophila brunnea</i> gp.	0	0	0	1	1	0%	0.3	0.5

B.4 MACROINVERTEBRATE DATA								
SILVER BOW CREEK at Opportunity - STATION 02.5 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TOTAL ORGANISMS	263	157	370	495	1285		321	145
TAXA RICHNESS	18	19	18	21	31		19.0	1.4
SHAN. DIVERSITY	2.45	2.67	2.25	2.08	2.37		2.36	0.25
BIOTIC INDEX	3.78	3.70	3.44	3.57	3.59		3.62	0.15
EPT RICHNESS	6	9	7	10	14		8.0	1.8
% R.A. DOMINANT	51%	38%	56%	55%	52%		50%	8.1%
% R.A. FILTERERS	65%	46%	71%	65%	65%		62%	11%
METALS TOLERANCE	6.59	7.09	6.52	6.79	6.71		6.75	0.26
Baetidae/Ephemeroptera	1.00	1.00	1.00	0.80	0.83		0.95	0.10
Hydropsychinae/Trichoptera	1.00	0.99	0.97	0.98	0.98		0.99	0.01
EPT / (EPT + CHIR.)	0.68	0.51	0.75	0.69	0.68		0.66	0.10

B.5 MACROINVERTEBRATE DATA								
SILVER BOW CREEK below Warm Springs Ponds - STATION 04.5 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						4%	118	
<i>Optioservus</i> spp.	197	90	81	75	443	4%	110.8	57.8
<i>Zaitzevia</i> sp.	10	0	10	6	26	0%	6.5	4.7
<i>Cleptelmis ornata</i>	0	0	0	1	1	0%	0.3	0.5
DIPTERA						12%	366	
<i>Pagastia</i> sp	10	12	0	11	33	0%	8.3	5.6
<i>Cardiocladius</i> spp.	12	35	2	34	83	1%	20.8	16.4
<i>Cricotopus</i> spp.	96	131	135	173	535	4%	133.8	31.5
<i>Eukiefferiella</i> spp.	0	11	0	2	13	0%	3.3	5.3
<i>Eukiefferiella devonica</i> gp.	54	48	41	55	198	2%	49.5	6.5
<i>Orthocladius</i> spp.	44	41	60	59	204	2%	51.0	9.9
<i>Parametriocnemus</i> sp.	0	0	3	2	5	0%	1.3	1.5
<i>Tvetenia</i> sp.	24	87	87	47	245	2%	61.3	31.2
<i>Glyptotendipes</i> sp.	0	1	0	0	1	0%	0.3	0.5
<i>Microtendipes</i> sp	1	2	7	11	21	0%	5.3	4.6
<i>Polypedilum</i> spp.	3	0	1	2	6	0%	1.5	1.3
<i>Tanytarsus</i> sp.	1	0	10	0	11	0%	2.8	4.9
<i>Micropsectra</i> spp.	9	2	0	0	11	0%	2.8	4.3
<i>Antocha</i> sp.	8	9	4	11	32	0%	8.0	2.9
<i>Hexatoma</i> sp.	0	0	4	0	4	0%	1.0	2.0
<i>Tipula</i> sp.	0	0	1	0	1	0%	0.3	0.5
<i>Simulium</i> spp.	11	5	10	33	59	0%	14.8	12.4
EPHEMEROPTERA						5%	139	
<i>Acentrella insignificans</i>	10	10	0	0	20	0%	5.0	5.8
<i>Baetis tricaudatus</i>	185	170	25	116	496	4%	124.0	72.3
<i>Baetis punctiventris</i>	10	0	1	11	22	0%	5.5	5.8
<i>Attenella margarita</i>	0	0	0	1	1	0%	0.3	0.5
<i>Ephemerella inermis</i>	0	0	1	0	1	0%	0.3	0.5
<i>Tricorythodes minutus</i>	0	0	14	3	17	0%	4.3	6.7
PLECOPTERA						0%	2	
<i>Amphinemura</i> sp.	1	0	0	0	1	0%	0.3	0.5
<i>Isoperla fulva</i>	0	1	0	1	2	0%	0.5	0.6
<i>Pteronarcella badia</i>	0	0	0	3	3	0%	0.8	1.5

B.5 MACROINVERTEBRATE DATA								
SILVER BOW CREEK below Warm Springs Ponds - STATION 04.5 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TRICHOPTERA						79%	2454	
<i>Cheumatopsyche</i> spp.	360	264	238	353	1215	10%	303.8	61.9
<i>Hydropsyche occidentalis</i>	1772	1833	1557	1720	6882	56%	1720.5	118.4
<i>Hydropsyche cockerelli</i>	11	13	24	17	65	1%	16.3	5.7
<i>Hydropsyche nr. morosa</i>	379	312	227	170	1088	9%	272.0	92.2
<i>Hydropsyche slossonae</i>	1	0	0	0	1	0%	0.3	0.5
<i>Lepidostoma</i> sp.	0	0	1	0	1	0%	0.3	0.5
<i>Hydroptila</i> spp.	51	12	38	52	153	1%	38.3	18.6
<i>Ochrotrichia</i> sp.	87	154	60	88	389	3%	97.3	40.0
<i>Oecetis</i> sp.	1	1	6	1	9	0%	2.3	2.5
<i>Rhyacophila brunnea</i> gp.	0	0	1	1	2	0%	0.5	0.6
<i>Helicopsyche borealis</i>	0	0	8	1	9	0%	2.3	3.9
<i>Glossosoma</i> sp.	0	0	0	1	1	0%	0.3	0.5
ANNELIDA						0%	6	
Tubificidae	11	13	0	1	25	0%	6.3	6.7
CRUSTACEA								
<i>Hyalella azteca</i>	3	4	5	2	14	0%	3.5	1.3
<i>Gammaurus</i> sp.	0	0	1	0	1	0%	0.3	0.5
MOLLUSCA						0%	2	
<i>Physella</i> sp.	0	0	5	0	5	0%	1.3	2.5
<i>Gyraulus</i> sp.	0	0	3	0	3	0%	0.8	1.5
<i>Sphaeriidae</i>	0	0	1	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	3362	3261	2672	3064	12359		3090	305
TAXA RICHNESS	28	25	34	33	47		30.0	4.2
SHAN. DIVERSITY	2.55	2.47	2.47	2.55	2.57		2.51	0.05
BIOTIC INDEX	5.05	5.05	5.15	5.12	5.09		5.09	0.05
EPT RICHNESS	12	10	14	16	21		13.0	2.6
% R.A. DOMINANT	53%	56%	58%	56%	56%		56%	2.3%
% R.A. FILTERERS	75%	74%	77%	75%	75%		75%	1%
METALS TOLERANCE	5.17	5.22	5.18	5.27	5.21		5.21	0.05
Baetidae/Ephemeroptera	1.00	1.00	0.63	0.97	0.97		0.90	0.18
Hydropsychinae/Trichoptera	0.95	0.94	0.95	0.94	0.94		0.94	0.01
EPT / (EPT + CHIR.)	0.92	0.88	0.86	0.87	0.88		0.88	0.03

B.6

MACROINVERTEBRATE DATA

WARM SPRINGS CREEK near mouth - STATION 06 - 26 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						10%	50	
<i>Optioservus spp.</i>	27	58	43	49	177	8%	44.3	13.0
<i>Zaitzevia sp.</i>	11	5	0	1	17	1%	4.3	5.0
<i>Cleptelmis ornata</i>	2	1	2	0	5	0%	1.3	1.0
<i>Brychius sp.</i>	0	1	0	0	1	0%	0.3	0.5
DIPTERA						32%	171	
<i>Pagastia sp</i>	19	13	27	28	87	4%	21.8	7.1
<i>Cardiocladius spp.</i>	4	2	2	0	8	0%	2.0	1.6
<i>Corynoneura sp</i>	1	0	0	0	1	0%	0.3	0.5
<i>Cricotopus spp.</i>	14	12	14	21	61	3%	15.3	3.9
<i>Eukiefferiella spp.</i>	10	8	17	11	46	2%	11.5	3.9
<i>Eukiefferiella devonica gp.</i>	15	14	13	13	55	3%	13.8	1.0
<i>Orthocladius spp.</i>	13	11	35	20	79	4%	19.8	10.9
<i>Parametriocnemus sp.</i>	1	1	0	2	4	0%	1.0	0.8
<i>Tvetenia sp.</i>	10	7	8	4	29	1%	7.3	2.5
<i>Micropsectra spp.</i>	9	5	8	29	51	2%	12.8	11.0
<i>Antocha sp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Dicranota sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Hexatoma sp.</i>	5	4	6	3	18	1%	4.5	1.3
<i>Tipula sp.</i>	1	1	0	0	2	0%	0.5	0.6
<i>Simulium spp.</i>	174	10	22	31	237	11%	59.3	77.0
<i>Chelifera sp.</i>	0	1	1	0	2	0%	0.5	0.6
EPHEMEROPTERA						21%	109	
<i>Baetis tricaudatus</i>	101	55	82	116	354	17%	88.5	26.3
<i>Diphetor hageni</i>	1	0	4	0	5	0%	1.3	1.9
<i>Caudatella sp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Serratella tibialis</i>	8	3	5	2	18	1%	4.5	2.6
<i>Drunella doddsi</i>	1	0	0	1	2	0%	0.5	0.6
<i>Drunella grandis</i>	0	3	1	1	5	0%	1.3	1.3
<i>Epeorus longimanus</i>	2	1	5	4	12	1%	3.0	1.8
<i>Heptagenia sp.</i>	0	0	3	0	3	0%	0.8	1.5
<i>Rhithrogena sp.</i>	5	15	4	10	34	2%	8.5	5.1
LEPIDOPTERA								
<i>Petrophila sp.</i>	0	1	0	0	1	0%	0.3	0.5

B.6 MACROINVERTEBRATE DATA								
WARM SPRINGS CREEK near mouth - STATION 06 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
PLECOPTERA						6%	31	
<i>Hesperoperla pacifica</i>	4	1	2	4	11	1%	2.8	1.5
<i>Malenka sp.</i>	3	0	0	0	3	0%	0.8	1.5
<i>Skwala sp.</i>	8	12	20	15	55	3%	13.8	5.1
<i>Pteronarcella badia</i>	26	7	12	10	55	3%	13.8	8.4
TRICHOPTERA						31%	165	
<i>Arctopsyche grandis</i>	70	45	169	71	355	17%	88.8	54.8
<i>Cheumatopsyche spp.</i>	5	6	2	3	16	1%	4.0	1.8
<i>Hydropsyche occidentalis</i>	54	50	30	29	163	8%	40.8	13.1
<i>Hydropsyche cockerelli</i>	2	1	0	0	3	0%	0.8	1.0
<i>Hydropsyche nr. morosa</i>	18	10	20	16	64	3%	16.0	4.3
<i>Hydropsyche oslari ?</i>	0	0	7	0	7	0%	1.8	3.5
<i>Hydroptila spp.</i>	0	1	0	3	4	0%	1.0	1.4
<i>Wormaldia sp.</i>	0	0	6	1	7	0%	1.8	2.9
<i>Brachycentrus occidentalis</i>	1	0	0	0	1	0%	0.3	0.5
<i>Rhyacophila brunnea gp.</i>	4	1	5	2	12	1%	3.0	1.8
<i>Agapetus sp.</i>	2	21	1	0	24	1%	6.0	10.0
<i>Glossosoma sp.</i>	3	1	0	1	5	0%	1.3	1.3
ANNELIDA						0%	1	
Naididae	1	0	0	0	1	0%	0.3	0.5
Tubificidae	0	1	0	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	635	390	578	501	2104		526	106
TAXA RICHNESS	36	37	33	29	48		33.8	3.6
SHAN. DIVERSITY	3.75	4.12	3.80	3.83	4.06		3.87	0.17
BIOTIC INDEX	4.48	3.96	3.70	4.06	4.07		4.05	0.32
EPT RICHNESS	19	17	19	17	25		18.0	1.2
% R.A. DOMINANT	27%	15%	29%	23%	17%		24%	6.4%
% R.A. FILTERERS	51%	31%	44%	30%	41%		39%	10%
METALS TOLERANCE	4.82	4.39	3.87	4.49	4.40		4.39	0.39
Baetidae/Ephemeroptera	0.86	0.71	0.82	0.87	0.83		0.82	0.07
Hydropsychinae/Trichoptera	0.50	0.49	0.25	0.38	0.38		0.40	0.12
EPT / (EPT + CHIR.)	0.77	0.76	0.75	0.69	0.74		0.74	0.03

B.7 MACROINVERTEBRATE DATA								
CLARK FORK RIVER below Warm Springs Creek - STATION 07 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						18%	514	
<i>Optioservus</i> spp.	380	508	327	348	1563	14%	390.8	81.1
<i>Zaitzevia</i> sp.	48	118	36	169	371	3%	92.8	62.4
<i>Cleptelmis ornata</i>	26	29	12	56	123	1%	30.8	18.4
DIPTERA						15%	431	
<i>Thienemannimyia</i> gp.	3	3	1	5	12	0%	3.0	1.6
<i>Pagastia</i> sp	55	77	77	51	260	2%	65.0	14.0
<i>Cardiocladius</i> spp.	8	6	1	10	25	0%	6.3	3.9
<i>Cricotopus</i> spp.	149	53	215	83	500	4%	125.0	72.2
<i>Cricotopus nostococladius</i>	5	0	12	2	19	0%	4.8	5.3
<i>Eukiefferiella</i> spp.	10	6	5	6	27	0%	6.8	2.2
<i>Eukiefferiella devonica</i> gp.	68	18	20	34	140	1%	35.0	23.1
<i>Orthocladius</i> spp.	51	65	36	47	199	2%	49.8	12.0
<i>Parametriocnemus</i> sp.	0	0	11	2	13	0%	3.3	5.3
<i>Tvetenia</i> sp.	72	28	47	70	217	2%	54.3	20.9
<i>Microtendipes</i> sp	2	10	15	7	34	0%	8.5	5.4
<i>Polypedilum</i> spp.	3	8	0	11	22	0%	5.5	4.9
<i>Rheotanytarsus</i> sp.	0	8	1	5	14	0%	3.5	3.7
<i>Micropsectra</i> spp.	25	11	0	7	43	0%	10.8	10.5
<i>Antocha</i> sp.	18	14	24	4	60	1%	15.0	8.4
<i>Hexatoma</i> sp.	0	1	0	0	1	0%	0.3	0.5
<i>Tipula</i> sp.	1	1	11	3	16	0%	4.0	4.8
<i>Simulium</i> spp.	46	0	46	20	112	1%	28.0	22.3
<i>Chelifera</i> sp.	3	2	2	2	9	0%	2.3	0.5
<i>Hemerodromia</i> sp.	1	0	0	0	1	0%	0.3	0.5
EPHEMEROPTERA						4%	98	
<i>Acentrella insignicans</i>	1	0	0	0	1	0%	0.3	0.5
<i>Baetis tricaudatus</i>	69	89	103	65	326	3%	81.5	17.8
<i>Baetis punctiventralis</i>	1	0	3	1	5	0%	1.3	1.3
<i>Attenella margarita</i>	0	0	1	0	1	0%	0.3	0.5
<i>Drunella grandis</i>	4	4	1	11	20	0%	5.0	4.2
<i>Paraleptophlebia</i> sp.	6	5	7	0	18	0%	4.5	3.1
<i>Tricorythodes minutus</i>	5	10	5	1	21	0%	5.3	3.7
MEGALOPTERA								
<i>Sialis</i> sp.	0	0	2	1	3	0%	0.8	1.0
ODONATA								
<i>Ophiogomphus</i> sp.	0	1	0	0	1	0%	0.3	0.5

B.7 MACROINVERTEBRATE DATA

CLARK FORK RIVER below Warm Springs Creek - STATION 07 - 26 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
PLECOPTERA						4%	107	
<i>Hesperoperla pacifica</i>	11	8	6	16	41	0%	10.3	4.3
<i>Malenka</i> sp.	14	5	3	5	27	0%	6.8	4.9
<i>Skwala</i> sp.	8	14	13	9	44	0%	11.0	2.9
<i>Isoperla fulva</i>	0	0	1	0	1	0%	0.3	0.5
<i>Pteronarcella badia</i>	74	81	70	90	315	3%	78.8	8.8
Chloroperlinae	1	0	0	0	1	0%	0.3	0.5
TRICHOPTERA						58%	1623	
<i>Arctopsyche grandis</i>	4	0	1	1	6	0%	1.5	1.7
<i>Cheumatopsyche</i> spp.	7	41	39	4	91	1%	22.8	20.0
<i>Hydropsyche occidentalis</i>	1284	1382	1468	1709	5843	52%	1460.8	181.8
<i>Hydropsyche cockerelli</i>	10	26	12	6	54	0%	13.5	8.7
<i>Hydropsyche nr. morosa</i>	68	30	23	53	174	2%	43.5	20.8
<i>Hydropsyche oslari</i> ?	5	0	0	0	5	0%	1.3	2.5
<i>Hydroptila</i> spp.	17	22	10	46	95	1%	23.8	15.6
<i>Leucotrichia pictipes</i>	49	7	7	36	99	1%	24.8	21.2
<i>Oecetis</i> sp.	0	0	8	3	11	0%	2.8	3.8
<i>Psychomyia flava</i>	0	0	1	0	1	0%	0.3	0.5
<i>Brachycentrus occidentalis</i>	1	2	1	3	7	0%	1.8	1.0
<i>Rhyacophila brunnea</i> gp.	44	6	19	23	92	1%	23.0	15.8
<i>Helicopsyche borealis</i>	1	10	1	0	12	0%	3.0	4.7
ANNELIDA						0%	7	
Naididae	1	2	0	0	3	0%	0.8	1.0
Tubificidae	0	7	16	0	23	0%	5.8	7.6
CRUSTACEA								
<i>Hyalella azteca</i>	1	0	3	0	4	0%	1.0	1.4
<i>Gammarus</i> sp.	0	0	1	0	1	0%	0.3	0.5
MOLLUSCA						0%	2	
<i>Physella</i> sp.	0	0	1	0	1	0%	0.3	0.5
<i>Sphaeriidae</i>	0	3	1	1	5	0%	1.3	1.3

B.7 MACROINVERTEBRATE DATA								
CLARK FORK RIVER below Warm Springs Creek - STATION 07 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TOTAL ORGANISMS	2660	2721	2726	3026	11133		2783	165
TAXA RICHNESS	44	40	48	41	57		43.3	3.6
SHAN. DIVERSITY	3.08	2.79	2.81	2.71	2.92		2.85	0.16
BIOTIC INDEX	4.86	4.77	4.96	4.81	4.85		4.85	0.08
EPT RICHNESS	22	17	23	18	26		20.0	2.9
% R.A. DOMINANT	48%	51%	54%	56%	52%		52%	3.6%
% R.A. FILTERERS	54%	55%	58%	60%	57%		57%	3%
METALS TOLERANCE	5.09	5.04	5.36	5.00	5.12		5.12	0.16
Baetidae/Ephemeroptera	0.83	0.82	0.88	0.85	0.85		0.84	0.03
Hydropsychinae/Trichoptera	0.92	0.97	0.97	0.94	0.95		0.95	0.02
EPT / (EPT + CHIR.)	0.79	0.86	0.80	0.86	0.83		0.83	0.04

B.8 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Deer Lodge - STATION 09 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						2%	79	
<i>Optioservus</i> spp.	37	35	10	12	94	1%	23.5	14.5
<i>Zaitzevia</i> sp.	54	57	53	58	222	2%	55.5	2.4
DIPTERA						25%	828	
<i>Thienemannimyia</i> gp.	0	1	0	1	2	0%	0.5	0.6
<i>Pagastia</i> sp	1	0	0	0	1	0%	0.3	0.5
<i>Cardiocladius</i> spp.	21	2	42	5	70	1%	17.5	18.3
<i>Cricotopus</i> spp.	228	110	46	128	512	4%	128.0	75.4
<i>Eukiefferiella</i> spp.	13	0	0	5	18	0%	4.5	6.1
<i>Eukiefferiella devonica</i> gp.	79	59	18	36	192	1%	48.0	26.6
<i>Nanocladius</i> sp.	10	0	0	0	10	0%	2.5	5.0
<i>Orthocladius</i> spp.	11	34	17	21	83	1%	20.8	9.7
<i>Parametriocnemus</i> sp.	15	5	0	2	22	0%	5.5	6.7
<i>Tvetenia</i> sp.	81	82	75	57	295	2%	73.8	11.6
<i>Paracladopelma</i> sp.	1	0	0	0	1	0%	0.3	0.5
<i>Polypedilum</i> spp.	11	16	5	6	38	0%	9.5	5.1
<i>Micropsectra</i> spp.	0	5	0	5	10	0%	2.5	2.9
<i>Antocha</i> sp.	1	5	0	1	7	0%	1.8	2.2
<i>Hexatoma</i> sp.	2	1	3	9	15	0%	3.8	3.6
<i>Simulium</i> spp.	583	380	730	341	2034	15%	508.5	181.8
<i>Hemerodromia</i> sp.	0	0	1	1	2	0%	0.5	0.6
EPHEMEROPTERA						9%	281	
<i>Acentrella insignificans</i>	29	38	14	10	91	1%	22.8	13.0
<i>Baetis tricaudatus</i>	354	238	229	195	1016	8%	254.0	69.2
<i>Drunella grandis</i>	1	0	0	0	1	0%	0.3	0.5
<i>Tricorythodes minutus</i>	2	15	0	0	17	0%	4.3	7.2
PLECOPTERA						3%	84	
<i>Isogenoides</i> sp.	29	18	17	4	68	1%	17.0	10.2
<i>Skwala</i> sp.	5	7	12	2	26	0%	6.5	4.2
<i>Pteronarcella badia</i>	67	65	90	20	242	2%	60.5	29.3
<i>Chloroperlinae</i>	1	0	0	0	1	0%	0.3	0.5

B.8 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Deer Lodge - STATION 09 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TRICHOPTERA						62%	2036	
<i>Arctopsyche grandis</i>	3	3	7	2	15	0%	3.8	2.2
<i>Cheumatopsyche spp.</i>	68	19	28	28	143	1%	35.8	21.9
<i>Hydropsyche occidentalis</i>	2441	1844	1696	1522	7503	57%	1875.8	399.2
<i>Hydropsyche cockerelli</i>	15	3	3	0	21	0%	5.3	6.7
<i>Hydropsyche nr. morosa</i>	94	50	95	101	340	3%	85.0	23.5
<i>Hydropsyche slossonae</i>	5	1	0	0	6	0%	1.5	2.4
<i>Hydroptila spp.</i>	10	0	2	0	12	0%	3.0	4.8
<i>Ochrotrichia sp.</i>	12	13	10	1	36	0%	9.0	5.5
<i>Oecetis sp.</i>	3	0	1	1	5	0%	1.3	1.3
<i>Brachycentrus occidentalis</i>	5	2	4	7	18	0%	4.5	2.1
<i>Protoptila sp.</i>	5	1	0	15	21	0%	5.3	6.8
<i>Glossosoma sp.</i>	14	6	1	1	22	0%	5.5	6.1
OTHER								
Turbellaria	1	0	0	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	4312	3115	3209	2597	13233		3308	721
TAXA RICHNESS	37	30	26	30	40		30.8	4.6
SHAN. DIVERSITY	2.47	2.38	2.31	2.32	2.43		2.37	0.07
BIOTIC INDEX	5.12	5.07	5.10	5.12	5.10		5.10	0.02
EPT RICHNESS	20	16	15	14	20		16.3	2.6
% R.A. DOMINANT	57%	59%	53%	59%	57%		57%	2.9%
% R.A. FILTERERS	75%	74%	80%	77%	76%		76%	3%
METALS TOLERANCE	5.35	5.18	5.27	5.33	5.29		5.28	0.07
Baetidae/Ephemeroptera	0.99	0.95	1.00	1.00	0.98		0.99	0.02
Hydropsychinae/Trichoptera	0.98	0.99	0.99	0.98	0.98		0.98	0.00
EPT / (EPT + CHIR.)	0.87	0.88	0.92	0.88	0.88		0.89	0.02

B.9 MACROINVERTEBRATE DATA								
CLARK FORK RIVER above Little Blackfoot River - STATION 10 - 26 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						3%	56	
<i>Optioservus spp.</i>	85	17	10	19	131	2%	32.8	35.0
<i>Zaitzevia sp.</i>	16	14	21	40	91	1%	22.8	11.9
<i>Cleptelmis ornata</i>	1	0	0	0	1	0%	0.3	0.5
DIPTERA						20%	408	
<i>Thienemannimyia gp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Pagastia sp</i>	0	1	0	0	1	0%	0.3	0.5
<i>Cardiocladius spp.</i>	2	5	5	0	12	0%	3.0	2.4
<i>Cricotopus spp.</i>	6	59	35	106	206	3%	51.5	42.3
<i>Eukiefferiella devonica gp.</i>	12	19	11	57	99	1%	24.8	21.8
<i>Orthocladius spp.</i>	11	0	3	18	32	0%	8.0	8.1
<i>Tvetenia sp.</i>	24	42	10	80	156	2%	39.0	30.3
<i>Polypedilum spp.</i>	39	22	5	90	156	2%	39.0	36.7
<i>Rheotanytarsus sp.</i>	0	1	0	2	3	0%	0.8	1.0
<i>Micropsectra spp.</i>	1	0	0	0	1	0%	0.3	0.5
<i>Antocha sp.</i>	1	1	0	1	3	0%	0.8	0.5
<i>Hexatoma sp.</i>	3	7	5	4	19	0%	4.8	1.7
<i>Simulium spp.</i>	442	172	78	251	943	12%	235.8	154.6
EPHEMEROPTERA						6%	127	
<i>Acentrella insignificans</i>	16	23	28	49	116	1%	29.0	14.2
<i>Baetis tricaudatus</i>	74	82	48	162	366	4%	91.5	49.2
<i>Attenella margarita</i>	0	2	0	1	3	0%	0.8	1.0
<i>Ephemerella inermis</i>	0	1	0	0	1	0%	0.3	0.5
<i>Tricorythodes minutus</i>	0	7	2	12	21	0%	5.3	5.4
HEMIPTERA								
<i>Saldula sp.</i>	1	0	0	0	1	0%	0.3	0.5
PLECOPTERA						3%	64	
<i>Hesperoperla pacifica</i>	1	0	0	0	1	0%	0.3	0.5
<i>Malenka sp.</i>	1	0	0	0	1	0%	0.3	0.5
<i>Isogenoides sp.</i>	43	28	13	26	110	1%	27.5	12.3
<i>Skwala sp.</i>	8	9	3	10	30	0%	7.5	3.1
<i>Isoperla fulva</i>	2	1	0	3	6	0%	1.5	1.3
<i>Pteronarcella badia</i>	41	13	4	40	98	1%	24.5	18.8
<i>Chloroperlinae</i>	2	1	1	6	10	0%	2.5	2.4

B.9 MACROINVERTEBRATE DATA									
CLARK FORK RIVER above Little Blackfoot River - STATION 10 - 26 AUG 96									
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.	
TRICHOPTERA						68%	1391		
<i>Arctopsyche grandis</i>	13	2	1	1	17	0%	4.3	5.9	
<i>Cheumatopsyche spp.</i>	152	50	42	221	465	6%	116.3	85.9	
<i>Hydropsyche occidentalis</i>	1327	632	642	1480	4081	50%	1020.3	446.9	
<i>Hydropsyche cockerelli</i>	7	17	25	1	50	1%	12.5	10.6	
<i>Hydropsyche nr. morosa</i>	157	153	52	242	604	7%	151.0	77.7	
<i>Hydropsyche oslari ?</i>	13	12	0	34	59	1%	14.8	14.1	
<i>Hydroptila spp.</i>	1	12	3	9	25	0%	6.3	5.1	
<i>Ochrotrichia sp.</i>	17	1	2	6	26	0%	6.5	7.3	
<i>Nectopsyche sp.</i>	0	0	0	1	1	0%	0.3	0.5	
<i>Oecetis sp.</i>	0	0	1	0	1	0%	0.3	0.5	
<i>Brachycentrus occidentalis</i>	31	12	51	15	109	1%	27.3	17.9	
<i>Protoptila sp.</i>	0	14	78	25	117	1%	29.3	34.1	
<i>Glossosoma sp.</i>	2	0	3	2	7	0%	1.8	1.3	
ID's by D. McGuire									
TOTAL ORGANISMS	2552	1433	1182	3014	8181		2045	879	
TAXA RICHNESS	33	33	28	32	42		31.5	2.4	
SHAN. DIVERSITY	2.59	3.11	2.77	2.92	2.93		2.85	0.22	
BIOTIC INDEX	5.01	4.98	4.60	5.02	4.95		4.90	0.20	
EPT RICHNESS	19	20	18	21	25		19.5	1.3	
% R.A. DOMINANT	52%	44%	54%	49%	50%		50%	4.4%	
% R.A. FILTERERS	84%	73%	75%	75%	77%		77%	5%	
METALS TOLERANCE	5.07	5.21	4.85	5.16	5.10		5.07	0.16	
Baetidae/Ephemeroptera	1.00	0.91	0.97	0.94	0.95		0.96	0.04	
Hydropsychinae/Trichoptera	0.96	0.95	0.85	0.97	0.95		0.93	0.06	
EPT / (EPT + CHIR.)	0.95	0.88	0.94	0.87	0.90		0.91	0.04	

B.10 MACROINVERTEBRATE DATA								
LITTLE BLACKFOOT RIVER near mouth - STATION 10.2 - 23 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						6%	48	
<i>Optioservus spp.</i>	32	6	55	27	120	4%	30.0	20.1
<i>Zaitzevia sp.</i>	14	4	9	43	70	2%	17.5	17.5
DIPTERA						56%	451	
<i>Pagastia sp</i>	1	4	6	8	19	1%	4.8	3.0
<i>Cardiocladus spp.</i>	15	8	25	29	77	2%	19.3	9.5
<i>Corynoneura sp</i>	1	0	0	0	1	0%	0.3	0.5
<i>Cricotopus spp.</i>	7	3	11	14	35	1%	8.8	4.8
<i>Cricotopus nostococladius</i>	3	0	1	6	10	0%	2.5	2.6
<i>Eukiefferiella spp.</i>	2	6	8	6	22	1%	5.5	2.5
<i>Eukiefferiella devonica gp.</i>	4	0	10	10	24	1%	6.0	4.9
<i>Orthocladius spp.</i>	21	22	28	17	88	3%	22.0	4.5
<i>Parametriocnemus sp.</i>	1	0	4	2	7	0%	1.8	1.7
<i>Tvetenia sp.</i>	10	4	33	8	55	2%	13.8	13.1
<i>Polypedilum spp.</i>	36	5	70	9	120	4%	30.0	30.0
<i>Rheotanytarsus sp.</i>	1	3	6	3	13	0%	3.3	2.1
<i>Micropsectra spp.</i>	65	18	146	54	283	9%	70.8	54.0
<i>Antocha sp.</i>	18	6	7	7	38	1%	9.5	5.7
<i>Hexatoma sp.</i>	7	2	7	5	21	1%	5.3	2.4
<i>Limonia sp.</i>	0	1	3	0	4	0%	1.0	1.4
<i>Simulium (Eusimulium)</i>	261	68	453	200	982	31%	245.5	160.1
<i>Chelifera sp.</i>	1	0	0	2	3	0%	0.8	1.0
EPHEMEROPTERA						4%	29	
<i>Acentrella insignicans</i>	0	1	1	1	3	0%	0.8	0.5
<i>Baetis tricaudatus</i>	11	3	34	12	60	2%	15.0	13.3
<i>Serratella tibialis</i>	12	6	15	9	42	1%	10.5	3.9
<i>Drunella grandis</i>	1	2	1	0	4	0%	1.0	0.8
<i>Rhithrogena sp.</i>	1	1	1	2	5	0%	1.3	0.5
<i>Tricorythodes minutus</i>	0	1	0	1	2	0%	0.5	0.6
PLECOPTERA						7%	59	
<i>Claassenia sabulosa</i>	2	0	3	1	6	0%	1.5	1.3
<i>Hesperoperla pacifica</i>	4	4	5	3	16	1%	4.0	0.8
<i>Skwala sp.</i>	4	3	3	7	17	1%	4.3	1.9
<i>Pteronarcella badia</i>	21	5	11	11	48	2%	12.0	6.6
<i>Pteronarcys californica</i>	2	2	0	12	16	1%	4.0	5.4
Chloroperlinae	38	5	58	31	132	4%	33.0	21.9

B.10 MACROINVERTEBRATE DATA								
LITTLE BLACKFOOT RIVER near mouth - STATION 10.2 - 23 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TRICHOPTERA						26%	210	
<i>Arctopsyche grandis</i>	26	10	22	23	81	3%	20.3	7.0
<i>Cheumatopsyche spp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Hydropsyche occidentalis</i>	1	3	6	1	11	0%	2.8	2.4
<i>Hydropsyche cockerelli</i>	41	12	48	35	136	4%	34.0	15.6
<i>Hydropsyche oslari ?</i>	168	25	204	82	479	15%	119.8	81.3
<i>Lepidostoma sp.</i>	2	2	2	2	8	0%	2.0	0.0
<i>Brachycentrus americanus</i>	1	0	2	0	3	0%	0.8	1.0
<i>Brachycentrus occidentalis</i>	16	4	15	7	42	1%	10.5	5.9
<i>Rhyacophila coloradensis gp</i>	11	5	19	12	47	1%	11.8	5.7
<i>Rhyacophila brunnea gp.</i>	1	0	1	0	2	0%	0.5	0.6
<i>Glossosoma sp.</i>	10	7	6	8	31	1%	7.8	1.7
ANNELIDA						0%	3	
Enchytrieidae	2	1	2	7	12	0%	3.0	2.7
Naididae	0	0	0	1	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	875	263	1341	718	3197		799	445
TAXA RICHNESS	40	36	39	39	45		38.5	1.7
SHAN. DIVERSITY	3.70	4.22	3.56	4.07	3.85		3.89	0.31
BIOTIC INDEX	3.91	3.98	4.16	4.02	4.05		4.02	0.11
EPT RICHNESS	20	20	20	19	23		19.8	0.5
% R.A. DOMINANT	30%	26%	34%	28%	31%		29%	3.4%
% R.A. FILTERERS	59%	48%	56%	49%	55%		53%	5%
METALS TOLERANCE	4.33	4.22	4.31	4.40	4.33		4.31	0.07
Baetidae/Ephemeroptera	0.44	0.29	0.67	0.52	0.54		0.48	0.16
Hydropsychinae/Trichoptera	0.76	0.59	0.79	0.69	0.75		0.71	0.09
EPT / (EPT + CHIR.)	0.69	0.58	0.57	0.61	0.61		0.61	0.05

B.11 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Gold Creek Bridge - STATION 11 - 23 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						8%	39	
<i>Optioservus</i> spp.	16	3	7	8	34	2%	8.5	5.4
<i>Zaitzevia</i> sp.	47	12	35	29	123	6%	30.8	14.6
DIPTERA						27%	139	
<i>Pagastia</i> sp	0	0	1	0	1	0%	0.3	0.5
<i>Cardiocladius</i> spp.	4	10	2	9	25	1%	6.3	3.9
<i>Cricotopus</i> spp.	6	5	3	5	19	1%	4.8	1.3
<i>Eukiefferiella</i> spp.	1	0	1	1	3	0%	0.8	0.5
<i>Eukiefferiella devonica</i> gp.	18	14	9	14	55	3%	13.8	3.7
<i>Orthocladius</i> spp.	0	1	2	3	6	0%	1.5	1.3
<i>Parametriocnemus</i> sp.	1	0	1	0	2	0%	0.5	0.6
<i>Tvetenia</i> sp.	15	13	48	16	92	5%	23.0	16.7
<i>Polypedilum</i> spp.	1	2	2	1	6	0%	1.5	0.6
<i>Micropsectra</i> spp.	1	0	0	0	1	0%	0.3	0.5
<i>Antocha</i> sp.	0	1	2	1	4	0%	1.0	0.8
<i>Hexatoma</i> sp.	4	5	3	3	15	1%	3.8	1.0
<i>Atherix pachypus</i>	7	0	2	5	14	1%	3.5	3.1
<i>Simulium (Eusimulium)</i>	37	80	44	150	311	15%	77.8	51.7
EPHEMEROPTERA						13%	65	
<i>Acentrella insignifcans</i>	10	22	9	8	49	2%	12.3	6.6
<i>Baetis tricaudatus</i>	65	33	39	59	196	10%	49.0	15.4
<i>Baetis punctiventris</i>	1	0	0	0	1	0%	0.3	0.5
<i>Attenella margarita</i>	2	0	1	1	4	0%	1.0	0.8
<i>Drunella grandis</i>	1	1	0	0	2	0%	0.5	0.6
<i>Rhithrogena</i> sp.	1	1	1	0	3	0%	0.8	0.5
<i>Tricorythodes minutus</i>	3	0	1	0	4	0%	1.0	1.4
PLECOPTERA						4%	23	
<i>Claassenia sabulosa</i>	11	3	12	9	35	2%	8.8	4.0
<i>Hesperoperla pacifica</i>	0	2	3	1	6	0%	1.5	1.3
<i>Zapada cinctipes</i>	1	0	0	0	1	0%	0.3	0.5
<i>Isogenoides</i> sp.	4	3	2	5	14	1%	3.5	1.3
<i>Skwala</i> sp.	9	1	6	5	21	1%	5.3	3.3
<i>Pteronarcella badia</i>	3	1	9	1	14	1%	3.5	3.8

B.11 MACROINVERTEBRATE DATA									
CLARK FORK RIVER at Gold Creek Bridge - STATION 11 - 23 AUG 96									
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.	
TRICHOPTERA						48%	244		
<i>Arctopsyche grandis</i>	33	19	47	11	110	5%	27.5	15.9	
<i>Cheumatopsyche spp.</i>	17	3	7	4	31	2%	7.8	6.4	
<i>Hydropsyche occidentalis</i>	108	188	126	115	537	26%	134.3	36.6	
<i>Hydropsyche cockerelli</i>	52	64	71	31	218	11%	54.5	17.5	
<i>Hydropsyche nr. morosa</i>	2	1	3	2	8	0%	2.0	0.8	
<i>Hydropsyche oslari ?</i>	0	2	1	1	4	0%	1.0	0.8	
<i>Hydroptila spp.</i>	1	0	0	0	1	0%	0.3	0.5	
<i>Ochrotrichia sp.</i>	4	0	4	2	10	0%	2.5	1.9	
<i>Brachycentrus occidentalis</i>	22	12	15	0	49	2%	12.3	9.2	
<i>Protoptila sp.</i>	1	0	0	1	2	0%	0.5	0.6	
<i>Glossosoma sp.</i>	1	0	1	2	4	0%	1.0	0.8	
OTHER									
Turbellaria	0	0	2	0	2	0%	0.5	1.0	
ID's by D. McGuire									
TOTAL ORGANISMS	510	502	522	503	2037		509	9	
TAXA RICHNESS	35	27	35	30	41		31.8	3.9	
SHAN. DIVERSITY	3.93	3.15	3.75	3.32	3.69		3.54	0.36	
BIOTIC INDEX	4.25	4.56	4.21	4.62	4.41		4.41	0.21	
EPT RICHNESS	22	16	19	17	24		18.5	2.6	
% R.A. DOMINANT	21%	37%	24%	30%	26%		28%	7.2%	
% R.A. FILTERERS	53%	74%	60%	62%	62%		62%	8%	
METALS TOLERANCE	4.38	4.65	4.22	4.78	4.50		4.51	0.25	
Baetidae/Ephemeroptera	0.92	0.96	0.94	0.99	0.95		0.95	0.03	
Hydropsychinae/Trichoptera	0.74	0.89	0.76	0.91	0.82		0.82	0.09	
EPT / (EPT + CHIR.)	0.88	0.89	0.84	0.84	0.86		0.86	0.03	

B.12 MACROINVERTEBRATE DATA								
FLINT CREEK at New Chicago - STATION 11.5 - 23 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						3%	52	
<i>Optioservus spp.</i>	26	63	50	22	161	2%	40.3	19.6
<i>Zaitzevia sp.</i>	15	3	10	17	45	1%	11.3	6.2
<i>Lara sp.</i>	0	0	0	1	1	0%	0.3	0.5
DIPTERA						18%	308	
<i>Thienemannimyia gp.</i>	3	0	0	0	3	0%	0.8	1.5
<i>Pagastia sp</i>	1	3	2	0	6	0%	1.5	1.3
<i>Brillia sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Cardiocladius spp.</i>	14	30	11	61	116	2%	29.0	22.9
<i>Cricotopus spp.</i>	70	31	35	19	155	2%	38.8	21.9
<i>Eukiefferiella spp.</i>	4	1	5	20	30	0%	7.5	8.5
<i>Eukiefferiella devonica gp.</i>	15	23	10	26	74	1%	18.5	7.3
<i>Orthocladius spp.</i>	125	18	35	65	243	4%	60.8	47.0
<i>Parametriocnemus sp.</i>	1	1	3	5	10	0%	2.5	1.9
<i>Paraphaenocladius sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Tvetenia sp.</i>	57	23	5	33	118	2%	29.5	21.7
<i>Polypedilum spp.</i>	23	1	4	1	29	0%	7.3	10.6
<i>Micropsectra spp.</i>	12	14	24	16	66	1%	16.5	5.3
<i>Antocha sp.</i>	2	1	1	0	4	0%	1.0	0.8
<i>Hexatoma sp.</i>	1	4	4	1	10	0%	2.5	1.7
<i>Tipula sp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Atherix pachypus</i>	0	0	1	0	1	0%	0.3	0.5
<i>Simulium (Eusimulium)</i>	65	54	8	238	365	5%	91.3	100.9
EPHEMEROPTERA						4%	64	
<i>Acentrella insignificans</i>	0	4	7	8	19	0%	4.8	3.6
<i>Baetis tricaudatus</i>	50	36	54	48	188	3%	47.0	7.7
<i>Serratella tibialis</i>	4	0	4	2	10	0%	2.5	1.9
<i>Drunella doddsi</i>	0	1	0	0	1	0%	0.3	0.5
<i>Drunella grandis</i>	0	2	0	1	3	0%	0.8	1.0
<i>Timpango hecuba</i>	1	1	1	0	3	0%	0.8	0.5
<i>Heptagenia sp.</i>	3	0	0	0	3	0%	0.8	1.5
<i>Rhithrogena sp.</i>	0	0	3	0	3	0%	0.8	1.5
<i>Paraleptophlebia sp.</i>	1	1	0	0	2	0%	0.5	0.6
<i>Tricorythodes minutus</i>	10	2	2	11	25	0%	6.3	4.9
HEMIPTERA								
<i>Gerris sp.</i>	0	0	0	1	1	0%	0.3	0.5

B.12 MACROINVERTEBRATE DATA								
FLINT CREEK at New Chicago - STATION 11.5 - 23 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
PLECOPTERA						6%	100	
<i>Claassenia sabulosa</i>	1	0	0	0	1	0%	0.3	0.5
<i>Hesperoperla pacifica</i>	5	4	4	8	21	0%	5.3	1.9
<i>Amphinemura sp.</i>	0	0	1	1	2	0%	0.5	0.6
<i>Zapada cinctipes</i>	1	1	0	1	3	0%	0.8	0.5
<i>Skwala sp.</i>	52	37	66	44	199	3%	49.8	12.4
<i>Isoperla fulva</i>	0	0	1	0	1	0%	0.3	0.5
<i>Pteronarcella badia</i>	26	19	41	56	142	2%	35.5	16.5
<i>Pteronarcys californica</i>	5	2	6	17	30	0%	7.5	6.6
TRICHOPTERA						70%	1204	
<i>Arctopsyche grandis</i>	82	69	86	105	342	5%	85.5	14.9
<i>Cheumatopsyche spp.</i>	4	5	5	5	19	0%	4.8	0.5
<i>Hydropsyche occidentalis</i>	819	535	520	746	2620	38%	655.0	150.3
<i>Hydropsyche cockerelli</i>	319	268	198	446	1231	18%	307.8	104.7
<i>Hydropsyche nr. morosa</i>	85	46	77	69	277	4%	69.3	16.8
<i>Hydropsyche oslari ?</i>	6	5	1	0	12	0%	3.0	2.9
<i>Hydropsyche slossonae</i>	7	5	4	0	16	0%	4.0	2.9
<i>Hydroptila spp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Brachycentrus occidentalis</i>	72	93	94	25	284	4%	71.0	32.3
<i>Rhyacophila sp.</i>	1	2	1	1	5	0%	1.3	0.5
<i>Protoptila sp.</i>	1	0	0	0	1	0%	0.3	0.5
<i>Glossosoma sp.</i>	2	3	2	0	7	0%	1.8	1.3
ANNELIDA						0%	3	
Tubificidae	8	0	0	1	9	0%	2.3	3.9
Erpobdellidae	0	0	1	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	1999	1414	1387	2122	6922		1731	385
TAXA RICHNESS	40	40	39	35	54		38.5	2.4
SHAN. DIVERSITY	3.26	3.28	3.38	3.22	3.37		3.28	0.07
BIOTIC INDEX	4.62	4.38	4.27	4.53	4.47		4.45	0.16
EPT RICHNESS	23	23	22	18	30		21.5	2.4
% R.A. DOMINANT	41%	38%	37%	35%	38%		38%	2.4%
% R.A. FILTERERS	73%	76%	72%	77%	75%		74%	3%
METALS TOLERANCE	4.63	4.54	4.41	4.59	4.56		4.54	0.09
Baetidae/Ephemeroptera	0.72	0.85	0.86	0.80	0.81		0.81	0.06
Hydropsychinae/Trichoptera	0.89	0.84	0.81	0.91	0.87		0.86	0.04
EPT / (EPT + CHIR.)	0.83	0.89	0.90	0.87	0.87		0.87	0.03

B.13 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Bearmouth - STATION 11.7 - 22 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						3%	53	
<i>Optioservus spp.</i>	18	24	27	28	97	1%	24.3	4.5
<i>Zaitzevia sp.</i>	34	31	26	23	114	2%	28.5	4.9
DIPTERA						19%	325	
<i>Thienemannimyia gp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Potthastia gaedii gp.</i>	5	0	0	0	5	0%	1.3	2.5
<i>Cardiocladus spp.</i>	14	11	45	80	150	2%	37.5	32.2
<i>Cricotopus spp.</i>	29	86	36	45	196	3%	49.0	25.5
<i>Eukiefferiella spp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Eukiefferiella devonica gp.</i>	16	8	58	36	118	2%	29.5	22.4
<i>Orthocladius spp.</i>	6	6	13	3	28	0%	7.0	4.2
<i>Parametriocnemus sp.</i>	0	3	5	0	8	0%	2.0	2.4
<i>Tvetenia sp.</i>	39	70	136	108	353	5%	88.3	42.5
<i>Microtendipes sp</i>	0	3	0	0	3	0%	0.8	1.5
<i>Polypedilum spp.</i>	2	15	18	5	40	1%	10.0	7.7
<i>Micropsectra spp.</i>	1	3	10	0	14	0%	3.5	4.5
<i>Antocha sp.</i>	0	0	0	3	3	0%	0.8	1.5
<i>Limnophila sp. ?</i>	0	1	1	3	5	0%	1.3	1.3
<i>Atherix pachypus</i>	0	4	7	9	20	0%	5.0	3.9
<i>Simulium spp.</i>	51	17	144	141	353	5%	88.3	64.2
Empididae	0	1	0	0	1	0%	0.3	0.5
EPHEMEROPTERA						9%	155	
<i>Acentrella insignificans</i>	42	31	36	37	146	2%	36.5	4.5
<i>Baetis tricaudatus</i>	74	94	163	99	430	6%	107.5	38.5
<i>Baetis punctiventris</i>	0	1	19	0	20	0%	5.0	9.3
<i>Attenella margarita</i>	0	4	0	0	4	0%	1.0	2.0
<i>Serratella tibialis</i>	0	0	5	0	5	0%	1.3	2.5
<i>Ephemerella inermis</i>	0	0	0	1	1	0%	0.3	0.5
<i>Drunella grandis</i>	0	2	0	5	7	0%	1.8	2.4
<i>Epeorus albertae</i>	0	0	1	0	1	0%	0.3	0.5
<i>Rhithrogena sp.</i>	1	1	0	0	2	0%	0.5	0.6
<i>Tricorythodes minutus</i>	0	4	0	1	5	0%	1.3	1.9

B.13 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Bearmouth - STATION 11.7 - 22 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
PLECOPTERA						2%	37	
<i>Claassenia sabulosa</i>	13	21	22	12	68	1%	17.0	5.2
<i>Hesperoperla pacifica</i>	1	0	0	0	1	0%	0.3	0.5
<i>Isogenoides sp.</i>	11	10	10	15	46	1%	11.5	2.4
<i>Skwala sp.</i>	3	3	1	2	9	0%	2.3	1.0
<i>Isoperla fulva</i>	2	0	0	0	2	0%	0.5	1.0
<i>Pteronarcella badia</i>	2	9	5	7	23	0%	5.8	3.0
TRICHOPTERA						66%	1120	
<i>Arctopsyche grandis</i>	47	24	32	31	134	2%	33.5	9.7
<i>Cheumatopsyche spp.</i>	5	10	21	0	36	1%	9.0	9.0
<i>Hydropsyche occidentalis</i>	628	814	912	988	3342	49%	835.5	155.6
<i>Hydropsyche cockerelli</i>	154	256	135	194	739	11%	184.8	53.5
<i>Hydropsyche nr. morosa</i>	5	7	8	1	21	0%	5.3	3.1
<i>Hydroptila spp.</i>	0	16	6	23	45	1%	11.3	10.2
<i>Ochrotrichia sp.</i>	27	11	55	60	153	2%	38.3	23.3
<i>Brachycentrus occidentalis</i>	0	1	6	0	7	0%	1.8	2.9
<i>Rhyacophila sp.</i>	0	0	1	1	2	0%	0.5	0.6
ANNELIDA						0%	0	
Erpobdellidae	1	0	0	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	1231	1603	1965	1961	6760		1690	350
TAXA RICHNESS	27	35	32	28	45		30.5	3.7
SHAN. DIVERSITY	2.81	2.78	3.12	2.85	2.98		2.89	0.15
BIOTIC INDEX	4.68	4.77	4.89	4.86	4.82		4.80	0.09
EPT RICHNESS	15	19	18	16	25		17.0	1.8
% R.A. DOMINANT	51%	51%	46%	50%	49%		50%	2.2%
% R.A. FILTERERS	72%	70%	64%	69%	69%		69%	4%
METALS TOLERANCE	4.75	4.91	4.86	4.97	4.88		4.87	0.10
Baetidae/Ephemeroptera	0.99	0.92	0.97	0.95	0.96		0.96	0.03
Hydropsychinae/Trichoptera	0.91	0.95	0.91	0.91	0.92		0.92	0.02
EPT / (EPT + CHIR.)	0.90	0.86	0.82	0.84	0.85		0.86	0.04

B.14 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Bonita - STATION 12 - 22 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						4%	48	
<i>Optioservus</i> spp.	18	3	17	32	70	1%	17.5	11.8
<i>Zaitzevia</i> sp.	12	9	38	61	120	2%	30.0	24.4
DIPTERA						22%	291	
<i>Thienemannimyia</i> gp.	0	0	0	9	9	0%	2.3	4.5
<i>Potthastia gaedii</i> gp.	0	0	0	2	2	0%	0.5	1.0
<i>Cardiocladius</i> spp.	5	5	15	3	28	1%	7.0	5.4
<i>Cricotopus</i> spp.	9	29	53	208	299	6%	74.8	90.6
<i>Eukiefferiella</i> spp.	1	9	4	3	17	0%	4.3	3.4
<i>Eukiefferiella devonica</i> gp.	13	27	32	162	234	4%	58.5	69.5
<i>Nanocladius</i> sp.	0	0	1	0	1	0%	0.3	0.5
<i>Orthocladius</i> spp.	0	0	3	8	11	0%	2.8	3.8
<i>Parametriocnemus</i> sp.	0	2	1	8	11	0%	2.8	3.6
<i>Thienemanniella</i> sp.	1	0	0	0	1	0%	0.3	0.5
<i>Tvetenia</i> sp.	25	38	35	155	253	5%	63.3	61.4
<i>Polypedilum</i> spp.	17	36	21	95	169	3%	42.3	36.1
<i>Tanytarsus</i> sp.	0	0	0	1	1	0%	0.3	0.5
<i>Rheotanytarsus</i> sp.	0	1	0	2	3	0%	0.8	1.0
<i>Antocha</i> sp.	2	0	1	1	4	0%	1.0	0.8
<i>Hexatoma</i> sp.	1	5	2	0	8	0%	2.0	2.2
<i>Atherix pachypus</i>	2	1	1	4	8	0%	2.0	1.4
<i>Simulium</i> spp.	21	27	9	47	104	2%	26.0	15.9
EPHEMEROPTERA						5%	68	
<i>Acentrella insignicans</i>	4	8	6	9	27	1%	6.8	2.2
<i>Baetis tricaudatus</i>	40	22	23	129	214	4%	53.5	51.0
<i>Baetis punctiventralis</i>	0	0	0	20	20	0%	5.0	10.0
<i>Serratella tibialis</i>	2	0	0	0	2	0%	0.5	1.0
<i>Drunella grandis</i>	1	2	0	1	4	0%	1.0	0.8
<i>Rhithrogena</i> sp.	0	1	0	0	1	0%	0.3	0.5
<i>Tricorythodes minutus</i>	0	0	0	2	2	0%	0.5	1.0
PLECOPTERA						5%	67	
<i>Claassenia sabulosa</i>	59	53	55	25	192	4%	48.0	15.5
<i>Hesperoperla pacifica</i>	2	1	0	0	3	0%	0.8	1.0
<i>Pteronarcys californica</i>	0	1	0	0	1	0%	0.3	0.5
<i>Pteronarcella badia</i>	0	0	0	1	1	0%	0.3	0.5
<i>Isogenoides</i> sp.	16	15	14	17	62	1%	15.5	1.3
<i>Isoperla fulva</i>	0	0	0	6	6	0%	1.5	3.0
<i>Kathroperla</i> sp.	0	1	0	0	1	0%	0.3	0.5
Chloroperlinae	0	1	0	0	1	0%	0.3	0.5

B.14 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Bonita - STATION 12 - 22 AUG 96								
<hr/>								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TRICHOPTERA						65%	866	
<i>Arctopsyche grandis</i>	2	3	5	7	17	0%	4.3	2.2
<i>Cheumatopsyche spp.</i>	5	1	3	3	12	0%	3.0	1.6
<i>Hydropsyche occidentalis</i>	435	355	731	1163	2684	50%	671.0	365.7
<i>Hydropsyche cockerelli</i>	120	89	114	197	520	10%	130.0	46.6
<i>Hydropsyche nr. morosa</i>	3	7	0	0	10	0%	2.5	3.3
<i>Hydroptila spp.</i>	2	6	1	48	57	1%	14.3	22.6
<i>Neotrichia sp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Ochrotrichia sp.</i>	9	25	9	88	131	2%	32.8	37.6
<i>Brachycentrus occidentalis</i>	2	2	0	15	19	0%	4.8	6.9
<i>Protoptila sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Glossosoma sp.</i>	1	3	2	4	10	0%	2.5	1.3
MOLLUSCA						0%	0	
<i>Physella sp.</i>	0	0	1	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	830	789	1197	2537	5353		1338	820
TAXA RICHNESS	29	33	27	35	47		31.0	3.7
SHAN. DIVERSITY	2.69	3.16	2.39	3.06	2.97		2.82	0.35
BIOTIC INDEX	4.66	4.84	4.90	5.17	4.98		4.89	0.21
EPT RICHNESS	16	20	11	18	26		16.3	3.9
% R.A. DOMINANT	52%	45%	61%	46%	50%		51%	7.4%
% R.A. FILTERERS	71%	61%	72%	56%	63%		65%	8%
METALS TOLERANCE	4.64	4.73	4.97	5.06	4.92		4.85	0.20
Baetidae/Ephemeroptera	0.94	0.91	1.00	0.98	0.97		0.96	0.04
Hydropsychinae/Trichoptera	0.97	0.92	0.98	0.89	0.93		0.94	0.04
EPT / (EPT + CHIR.)	0.91	0.80	0.85	0.73	0.79		0.82	0.08

B.15 MACROINVERTEBRATE DATA								
ROCK CREEK near mouth - STATION 12.5 - 22 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						6%	29	
<i>Optioservus</i> spp.	1	10	2	15	28	1%	7.0	6.7
<i>Zaitzevia</i> sp.	10	28	10	30	78	4%	19.5	11.0
<i>Ordobrevia</i> sp.	0	7	1	3	11	1%	2.8	3.1
DIPTERA						40%	205	
<i>Pagastia</i> sp.	1	0	1	1	3	0%	0.8	0.5
<i>Cardiocladius</i> spp.	10	2	15	17	44	2%	11.0	6.7
<i>Cricotopus</i> spp.	5	1	2	1	9	0%	2.3	1.9
<i>Eukiefferiella</i> spp.	15	6	27	4	52	3%	13.0	10.5
<i>Eukiefferiella devonica</i> gp.	3	0	3	10	16	1%	4.0	4.2
<i>Orthocladius</i> spp.	5	1	1	1	8	0%	2.0	2.0
<i>Tvetenia</i> sp.	26	34	59	52	171	8%	42.8	15.3
<i>Polypedilum</i> spp.	8	24	7	10	49	2%	12.3	7.9
<i>Rheotanytarsus</i> sp.	0	2	0	0	2	0%	0.5	1.0
<i>Tanytarsus</i> sp.	0	2	0	0	2	0%	0.5	1.0
<i>Micropsectra</i> spp.	14	129	52	115	310	15%	77.5	54.0
<i>Antocha</i> sp.	0	0	1	0	1	0%	0.3	0.5
<i>Hexatoma</i> sp.	3	4	0	3	10	0%	2.5	1.7
<i>Atherix pachypus</i>	1	1	1	0	3	0%	0.8	0.5
<i>Simulium (Eusimulium)</i>	16	19	30	72	137	7%	34.3	25.9
<i>Chelifera</i> sp.	1	0	0	0	1	0%	0.3	0.5
EPHEMEROPTERA						30%	152	
<i>Acentrella insignificans</i>	48	21	32	16	117	6%	29.3	14.2
<i>Baetis tricaudatus</i>	19	23	17	15	74	4%	18.5	3.4
<i>Serratella tibialis</i>	56	81	34	96	267	13%	66.8	27.4
<i>Drunella coloradensis</i>	0	0	0	1	1	0%	0.3	0.5
<i>Drunella doddsi</i>	13	7	5	7	32	2%	8.0	3.5
<i>Drunella grandis</i>	0	1	0	1	2	0%	0.5	0.6
<i>Epeorus albertae</i>	9	20	4	0	33	2%	8.3	8.7
<i>Epeorus longimanus</i>	0	0	0	1	1	0%	0.3	0.5
<i>Heptagenia</i> sp.	6	19	0	0	25	1%	6.3	9.0
<i>Rhithrogena</i> sp.	5	10	9	29	53	3%	13.3	10.7
<i>Paraleptophlebia</i> sp.	0	1	0	0	1	0%	0.3	0.5

B.15 MACROINVERTEBRATE DATA								
ROCK CREEK near mouth - STATION 12.5 - 22 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
PLECOPTERA						3%	14	
<i>Claassenia sabulosa</i>	1	1	0	4	6	0%	1.5	1.7
<i>Hesperoperla pacifica</i>	1	1	2	0	4	0%	1.0	0.8
<i>Calineuria californica</i>	0	0	1	0	1	0%	0.3	0.5
<i>Malenka sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Skwala sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Pteronarcella badia</i>	1	1	1	0	3	0%	0.8	0.5
<i>Pteronarcys californica</i>	1	7	2	6	16	1%	4.0	2.9
Chloroperlinae	1	11	6	4	22	1%	5.5	4.2
TRICHOPTERA						22%	114	
<i>Arctopsyche grandis</i>	80	48	54	67	249	12%	62.3	14.2
<i>Cheumatopsyche spp.</i>	0	1	0	1	2	0%	0.5	0.6
<i>Hydropsyche occidentalis</i>	9	7	5	14	35	2%	8.8	3.9
<i>Hydropsyche cockerelli</i>	24	22	18	37	101	5%	25.3	8.2
<i>Hydropsyche oslari ?</i>	8	6	6	1	21	1%	5.3	3.0
<i>Hydroptila spp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Lepidostoma sp.</i>	0	1	0	2	3	0%	0.8	1.0
<i>Wormaldia sp.</i>	1	2	1	1	5	0%	1.3	0.5
<i>Brachycentrus occidentalis</i>	20	7	9	0	36	2%	9.0	8.3
<i>Rhyacophila sp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Glossosoma sp.</i>	1	0	1	1	3	0%	0.8	0.5
ANNELIDA						0%	0	
Lumbricidae	0	0	0	1	1	0%	0.3	0.5
OTHER								
Turbellaria	0	0	1	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	423	570	420	641	2054		514	110
TAXA RICHNESS	34	39	34	36	51		35.8	2.4
SHAN. DIVERSITY	4.11	4.07	4.07	3.88	4.22		4.03	0.10
BIOTIC INDEX	3.41	3.48	3.88	3.58	3.58		3.59	0.21
EPT RICHNESS	19	24	18	21	30		20.5	2.6
% R.A. DOMINANT	19%	23%	14%	18%	15%		18%	3.5%
% R.A. FILTERERS	37%	20%	29%	30%	29%		29%	7%
METALS TOLERANCE	3.26	2.55	3.60	3.04	3.06		3.11	0.44
Baetidae/Ephemeroptera	0.43	0.24	0.49	0.19	0.32		0.34	0.14
Hydropsychinae/Trichoptera	0.29	0.38	0.31	0.42	0.35		0.35	0.06
EPT / (EPT + CHIR.)	0.78	0.60	0.55	0.59	0.63		0.63	0.10

B.16 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Turah - STATION 13 - 22 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						2%	30	
<i>Optioservus</i> spp.	11	5	11	12	39	1%	9.8	3.2
<i>Zaitzevia</i> sp.	14	21	20	25	80	1%	20.0	4.5
DIPTERA						29%	392	
<i>Thienemannimyia</i> gp.	0	1	0	1	2	0%	0.5	0.6
<i>Potthastia gaedii</i> gp.	0	1	4	0	5	0%	1.3	1.9
<i>Cardiocladius</i> spp.	11	39	26	4	80	1%	20.0	15.6
<i>Corynoneura</i> sp	0	0	1	0	1	0%	0.3	0.5
<i>Cricotopus</i> spp.	18	11	37	42	108	2%	27.0	14.9
<i>Eukiefferiella</i> spp.	8	5	11	5	29	1%	7.3	2.9
<i>Eukiefferiella devonica</i> gp.	38	37	83	41	199	4%	49.8	22.2
<i>Orthocladius</i> spp.	12	0	5	2	19	0%	4.8	5.3
<i>Parametriocnemus</i> sp.	0	3	3	2	8	0%	2.0	1.4
<i>Tvetenia</i> sp.	25	35	90	34	184	3%	46.0	29.7
<i>Demicryptochironomus</i> sp.	0	1	0	0	1	0%	0.3	0.5
<i>Microtendipes</i> sp	1	0	0	0	1	0%	0.3	0.5
<i>Paracladopelma</i> sp.	1	0	0	0	1	0%	0.3	0.5
<i>Polypedilum</i> spp.	15	74	36	21	146	3%	36.5	26.5
<i>Rheotanytarsus</i> sp.	3	1	4	3	11	0%	2.8	1.3
<i>Micropsectra</i> spp.	50	9	22	11	92	2%	23.0	18.9
<i>Antocha</i> sp.	2	0	0	0	2	0%	0.5	1.0
<i>Hexatoma</i> sp.	2	2	2	0	6	0%	1.5	1.0
<i>Atherix pachypus</i>	5	3	19	5	32	1%	8.0	7.4
<i>Simulium</i> (<i>Eusimulium</i>)	126	296	166	54	642	12%	160.5	101.5
EPHEMEROPTERA						19%	255	
<i>Acentrella insignificans</i>	50	44	67	60	221	4%	55.3	10.2
<i>Baetis tricaudatus</i>	88	64	98	80	330	6%	82.5	14.4
<i>Diphotor hageni</i>	0	3	0	0	3	0%	0.8	1.5
<i>Attenella margarita</i>	1	0	4	2	7	0%	1.8	1.7
<i>Serratella tibialis</i>	66	70	131	108	375	7%	93.8	31.2
<i>Ephemerella inermis</i>	1	0	0	0	1	0%	0.3	0.5
<i>Drunella grandis</i>	13	2	5	10	30	1%	7.5	4.9
<i>Epeorus albertae</i>	0	0	1	0	1	0%	0.3	0.5
<i>Heptagenia</i> sp.	0	1	0	0	1	0%	0.3	0.5
<i>Rhithrogena</i> sp.	5	31	11	2	49	1%	12.3	13.0
<i>Tricorythodes minutus</i>	0	2	0	1	3	0%	0.8	1.0
HEMIPTERA								
<i>Saldula</i> sp.	0	0	1	0	1	0%	0.3	0.5

B.16 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Turah - STATION 13 - 22 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
PLECOPTERA						3%	47	
<i>Calineuria californica</i>	0	0	1	2	3	0%	0.8	1.0
<i>Claassenia sabulosa</i>	13	27	13	9	62	1%	15.5	7.9
<i>Hesperoperla pacifica</i>	7	5	14	9	35	1%	8.8	3.9
<i>Zapada cinctipes</i>	1	0	1	0	2	0%	0.5	0.6
<i>Isogenoides</i> sp.	4	18	9	12	43	1%	10.8	5.9
<i>Skwala</i> sp.	1	0	0	0	1	0%	0.3	0.5
<i>Isoperla fulva</i>	0	0	1	2	3	0%	0.8	1.0
<i>Pteronarcella badia</i>	0	2	4	1	7	0%	1.8	1.7
<i>Pteronarcys californica</i>	3	0	7	6	16	0%	4.0	3.2
<i>Kathroperla</i> sp.	0	2	0	0	2	0%	0.5	1.0
Chloroperlinae	3	8	1	0	12	0%	3.0	3.6
TRICHOPTERA						47%	630	
<i>Arctopsyche grandis</i>	62	42	111	78	293	5%	73.3	29.2
<i>Cheumatopsyche</i> spp.	32	9	46	39	126	2%	31.5	16.1
<i>Hydropsyche occidentalis</i>	252	183	341	290	1066	20%	266.5	66.5
<i>Hydropsyche cockerelli</i>	208	47	390	216	861	16%	215.3	140.1
<i>Hydropsyche nr. morosa</i>	0	0	0	1	1	0%	0.3	0.5
<i>Hydroptila</i> spp.	3	6	1	12	22	0%	5.5	4.8
<i>Ochrotrichia</i> sp.	2	8	6	11	27	0%	6.8	3.8
<i>Wormaldia</i> sp.	0	0	1	2	3	0%	0.8	1.0
<i>Brachycentrus occidentalis</i>	25	1	34	52	112	2%	28.0	21.2
<i>Glossosoma</i> sp.	3	0	1	5	9	0%	2.3	2.2
ID's by D. McGuire								
TOTAL ORGANISMS	1185	1119	1840	1272	5416		1354	330
TAXA RICHNESS	39	38	43	39	55		39.8	2.2
SHAN. DIVERSITY	3.89	3.83	3.87	3.91	4.01		3.88	0.04
BIOTIC INDEX	4.28	4.44	4.28	4.17	4.28		4.29	0.11
EPT RICHNESS	22	21	25	24	32		23.0	1.8
% R.A. DOMINANT	21%	26%	21%	23%	20%		23%	2.5%
% R.A. FILTERERS	60%	52%	59%	58%	58%		57%	4%
METALS TOLERANCE	4.14	4.38	4.18	4.14	4.20		4.21	0.12
Baetidae/Ephemeroptera	0.62	0.51	0.52	0.53	0.54		0.55	0.05
Hydropsychinae/Trichoptera	0.84	0.81	0.83	0.77	0.82		0.81	0.03
EPT / (EPT + CHIR.)	0.82	0.73	0.80	0.86	0.81		0.80	0.06

B.17 MACROINVERTEBRATE DATA

BLACKFOOT RIVER near mouth - STATION 14 - 21 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						7%	31	
<i>Optioservus spp.</i>	11	7	7	7	32	2%	8.0	2.0
<i>Zaitzevia sp.</i>	18	12	18	38	86	5%	21.5	11.4
<i>Cleptelmis ornata</i>	0	1	0	2	3	0%	0.8	1.0
<i>Ordobrevia sp.</i>	1	0	0	0	1	0%	0.3	0.5
DIPTERA						12%	50	
<i>Potthastia gaedii gp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Cardiocladius spp.</i>	2	0	1	1	4	0%	1.0	0.8
<i>Corynoneura sp</i>	0	2	2	0	4	0%	1.0	1.2
<i>Cricotopus spp.</i>	1	3	0	1	5	0%	1.3	1.3
<i>Eukiefferiella spp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Eukiefferiella devonica gp.</i>	1	0	0	0	1	0%	0.3	0.5
<i>Orthocladius spp.</i>	0	1	0	1	2	0%	0.5	0.6
<i>Tvetenia sp.</i>	1	0	0	0	1	0%	0.3	0.5
<i>Microtendipes sp</i>	0	1	2	1	4	0%	1.0	0.8
<i>Polypedilum spp.</i>	6	2	2	6	16	1%	4.0	2.3
<i>Cladotanytarsus sp.</i>	0	1	2	0	3	0%	0.8	1.0
<i>Rheotanytarsus sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Zavrelia sp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Micropsectra spp.</i>	10	2	43	42	97	6%	24.3	21.3
<i>Antocha sp.</i>	0	2	0	1	3	0%	0.8	1.0
<i>Hesperoconopa sp. ?</i>	2	0	0	0	2	0%	0.5	1.0
<i>Hexatoma sp.</i>	6	0	7	3	16	1%	4.0	3.2
<i>Atherix pachypus</i>	3	0	0	0	3	0%	0.8	1.5
<i>Simulium (Eusimulium)</i>	8	4	12	10	34	2%	8.5	3.4
EPHEMEROPTERA						22%	94	
<i>Acentrella insignificans</i>	38	42	28	42	150	9%	37.5	6.6
<i>Baetis tricaudatus</i>	26	26	29	36	117	7%	29.3	4.7
<i>Baetis bicaudatus</i>	3	4	3	4	14	1%	3.5	0.6
<i>Serratella tibialis</i>	12	6	7	11	36	2%	9.0	2.9
<i>Drunella doddsi</i>	5	1	7	0	13	1%	3.3	3.3
<i>Drunella grandis</i>	1	4	4	3	12	1%	3.0	1.4
<i>Epeorus albertae</i>	0	0	2	1	3	0%	0.8	1.0
<i>Rhithrogena sp.</i>	6	4	8	10	28	2%	7.0	2.6
<i>Paraleptophlebia bicornuta</i>	1	0	0	0	1	0%	0.3	0.5
LEPIDOPTERA								
<i>Petrophila sp.</i>	0	1	0	0	1	0%	0.3	0.5

B.17 MACROINVERTEBRATE DATA								
BLACKFOOT RIVER near mouth - STATION 14 - 21 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
PLECOPTERA						3%	11	
<i>Claassenia sabulosa</i>	2	1	0	4	7	0%	1.8	1.7
<i>Calineuria californica</i>	4	1	3	2	10	1%	2.5	1.3
<i>Hesperoperla pacifica</i>	1	0	1	1	3	0%	0.8	0.5
<i>Skwala sp.</i>	0	3	0	1	4	0%	1.0	1.4
<i>Pteronarcys californica</i>	6	2	4	4	16	1%	4.0	1.6
Chloroperlinae	0	1	3	0	4	0%	1.0	1.4
TRICHOPTERA						56%	239	
<i>Arctopsyche grandis</i>	20	7	5	9	41	2%	10.3	6.7
<i>Cheumatopsyche spp.</i>	15	20	13	31	79	5%	19.8	8.1
<i>Hydropsyche occidentalis</i>	66	55	56	63	240	14%	60.0	5.4
<i>Hydropsyche cockerelli</i>	125	69	86	88	368	22%	92.0	23.6
<i>Hydropsyche oslari ?</i>	5	4	3	7	19	1%	4.8	1.7
<i>Psychomyia flava</i>	3	1	3	0	7	0%	1.8	1.5
<i>Brachycentrus occidentalis</i>	30	65	52	11	158	9%	39.5	23.9
<i>Rhyacophila angelita gp.</i>	2	0	4	3	9	1%	2.3	1.7
<i>Helicopsyche borealis</i>	0	1	0	1	2	0%	0.5	0.6
<i>Glossosoma sp.</i>	4	7	8	14	33	2%	8.3	4.2
ANNELIDA						0%	0	
Naididae	0	0	0	1	1	0%	0.3	0.5
MOLLUSCA						0%	1	
<i>Physella sp.</i>	0	1	1	0	2	0%	0.5	0.6
OTHER								
Turbellaria	1	3	0	0	4	0%	1.0	1.4
ID's by D. McGuire								
TOTAL ORGANISMS	446	370	426	461	1703		426	40
TAXA RICHNESS	35	39	32	35	52		35.3	2.9
SHAN. DIVERSITY	3.82	3.81	3.93	3.95	4.03		3.88	0.07
BIOTIC INDEX	3.70	3.68	3.58	3.82	3.70		3.69	0.10
EPT RICHNESS	21	21	21	21	25		21.0	0.0
% R.A. DOMINANT	28%	19%	20%	19%	22%		21%	4.4%
% R.A. FILTERERS	60%	61%	53%	48%	55%		55%	6%
METALS TOLERANCE	3.81	3.98	3.52	3.83	3.78		3.79	0.19
Baetidae/Ephemeroptera	0.73	0.83	0.68	0.77	0.75		0.75	0.06
Hydropsychinae/Trichoptera	0.78	0.65	0.69	0.83	0.74		0.74	0.09
EPT / (EPT + CHIR.)	0.95	0.96	0.86	0.87	0.91		0.91	0.05

B.18

MACROINVERTEBRATE DATA

CLARK FORK RIVER above Missoula - STATION 15.5 - 22 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA								
<i>Optioservus</i> spp.	8	3	9	12	32	1%	8.0	3.7
<i>Zaitzevia</i> sp.	54	2	24	48	128	4%	32.0	23.8
<i>Cleptelmis ornata</i>	1	0	0	0	1	0%	0.3	0.5
<i>Ordobrevia</i> sp.	1	2	0	0	3	0%	0.8	1.0
DIPTERA								
<i>Pagastia</i> sp.	2	0	1	1	4	0%	1.0	0.8
<i>Cardiocladius</i> spp.	1	0	6	7	14	0%	3.5	3.5
<i>Cricotopus</i> spp.	12	0	10	7	29	1%	7.3	5.3
<i>Cricotopus nostococladius</i>	5	0	0	5	10	0%	2.5	2.9
<i>Eukiefferiella</i> spp.	2	0	1	1	4	0%	1.0	0.8
<i>Eukiefferiella devonica</i> gp.	23	1	15	26	65	2%	16.3	11.2
<i>Nanocladius</i> sp.	1	0	0	0	1	0%	0.3	0.5
<i>Orthocladius</i> spp.	0	0	2	0	2	0%	0.5	1.0
<i>Tvetenia</i> sp.	10	0	1	2	13	0%	3.3	4.6
<i>Microtendipes</i> sp.	1	1	3	0	5	0%	1.3	1.3
<i>Polypedilum</i> spp.	16	9	7	16	48	2%	12.0	4.7
<i>Rheotanytarsus</i> sp.	0	0	1	1	2	0%	0.5	0.6
<i>Micropsectra</i> spp.	4	0	12	2	18	1%	4.5	5.3
<i>Antocha</i> sp.	4	1	0	9	14	0%	3.5	4.0
<i>Simulium</i> (<i>Eusimulium</i>)	99	31	43	59	232	7%	58.0	29.6
<i>Hemerodromia</i> sp.	0	0	0	1	1	0%	0.3	0.5
EPHEMEROPTERA								
<i>Acentrella insignicans</i>	89	24	20	10	143	4%	35.8	36.0
<i>Baetis tricaudatus</i>	49	3	25	64	141	4%	35.3	26.8
<i>Diphetor hageni</i>	0	0	0	1	1	0%	0.3	0.5
<i>Attenella margarita</i>	0	1	0	2	3	0%	0.8	1.0
<i>Caudatella</i> sp.	1	0	0	2	3	0%	0.8	1.0
<i>Serratella tibialis</i>	46	13	10	26	95	3%	23.8	16.4
<i>Ephemerella inermis</i>	1	0	0	0	1	0%	0.3	0.5
<i>Drunella doddsi</i>	0	1	1	0	2	0%	0.5	0.6
<i>Drunella grandis</i>	35	2	15	22	74	2%	18.5	13.8
<i>Epeorus albertae</i>	3	3	1	1	8	0%	2.0	1.2
<i>Rhithrogena</i> sp.	5	6	6	2	19	1%	4.8	1.9
PLECOPTERA								
						4%	32	

B.18 MACROINVERTEBRATE DATA								
CLARK FORK RIVER above Missoula - STATION 15.5 - 22 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
<i>Claassenia sabulosa</i>	2	4	2	3	11	0%	2.8	1.0
<i>Calineuria californica</i>	2	0	0	1	3	0%	0.8	1.0
<i>Hesperoperla pacifica</i>	10	4	7	1	22	1%	5.5	3.9
<i>Isogenoides</i> sp.	2	1	1	1	5	0%	1.3	0.5
<i>Pteronarcella badia</i>	2	0	0	2	4	0%	1.0	1.2
<i>Pteronarcys californica</i>	50	0	13	19	82	3%	20.5	21.2
 TRICHOPTERA						60%	480	
<i>Arctopsyche grandis</i>	14	0	10	4	28	1%	7.0	6.2
<i>Cheumatopsyche</i> spp.	122	39	29	57	247	8%	61.8	41.8
<i>Hydropsyche occidentalis</i>	560	89	115	252	1016	32%	254.0	216.2
<i>Hydropsyche cockerelli</i>	212	82	92	140	526	17%	131.5	59.3
<i>Hydroptila</i> spp.	8	0	2	5	15	0%	3.8	3.5
<i>Ochrotrichia</i> sp.	2	0	2	8	12	0%	3.0	3.5
<i>Ceraclea</i> sp.	0	0	0	1	1	0%	0.3	0.5
<i>Wormaldia</i> sp.	2	0	0	3	5	0%	1.3	1.5
<i>Psychomyia flava</i>	1	1	0	0	2	0%	0.5	0.6
<i>Brachycentrus occidentalis</i>	19	7	8	13	47	1%	11.8	5.5
<i>Micrasema</i> sp.	0	0	0	3	3	0%	0.8	1.5
<i>Rhyacophila angelita</i> gp.	1	1	0	4	6	0%	1.5	1.7
<i>Rhyacophila coloradensis</i> gp.	2	0	2	6	10	0%	2.5	2.5
<i>Glossosoma</i> sp.	0	1	1	1	3	0%	0.8	0.5
 ANNELIDA						0%	2	
Lumbricidae	0	0	1	3	4	0%	1.0	1.4
Lumbriculidae	1	0	0	3	4	0%	1.0	1.4
Naididae	0	0	0	1	1	0%	0.3	0.5
 OTHER								
Turbellaria	2	0	2	1	5	0%	1.3	1.0
ID's by D. McGuire								
TOTAL ORGANISMS	1487	332	500	859	3178		795	511
TAXA RICHNESS	44	26	36	47	55		38.3	9.4
SHAN. DIVERSITY	3.37	3.21	3.92	3.77	3.66		3.57	0.33
BIOTIC INDEX	4.38	4.25	4.29	4.36	4.35		4.32	0.06
EPT RICHNESS	25	18	20	28	31		22.8	4.6
% R.A. DOMINANT	38%	27%	23%	29%	32%		29%	6.2%
% R.A. FILTERERS	69%	75%	60%	62%	66%		66%	7%
METALS TOLERANCE	4.38	4.24	4.30	4.37	4.35		4.32	0.06
Baetidae/Ephemeroptera	0.60	0.51	0.58	0.58	0.58		0.57	0.04
Hydropsychinae/Trichoptera	0.95	0.95	0.90	0.90	0.93		0.93	0.03
EPT / (EPT + CHIR.)	0.94	0.96	0.86	0.91	0.92		0.92	0.04

B.19

MACROINVERTEBRATE DATA

CLARK FORK RIVER at Shuffield's - STATION 18 - 21 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						1%	6	
<i>Optioservus spp.</i>	3	0	2	1	6	0%	1.5	1.3
<i>Zaitzevia sp.</i>	8	3	1	4	16	1%	4.0	2.9
Hydrophilidae	1	0	0	0	1	0%	0.3	0.5
DIPTERA						13%	90	
<i>Thienemannimyia gp.</i>	2	0	0	0	2	0%	0.5	1.0
<i>Pagastia sp</i>	2	0	1	1	4	0%	1.0	0.8
<i>Brillia sp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Cardiocladius spp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Cricotopus spp.</i>	15	11	16	16	58	2%	14.5	2.4
<i>Eukiefferiella spp.</i>	0	1	0	1	2	0%	0.5	0.6
<i>Eukiefferiella devonica gp.</i>	9	0	2	6	17	1%	4.3	4.0
<i>Orthocladius spp.</i>	7	3	3	7	20	1%	5.0	2.3
<i>Tvetenia sp.</i>	2	2	0	5	9	0%	2.3	2.1
<i>Microtendipes sp</i>	0	0	0	1	1	0%	0.3	0.5
<i>Polypedilum spp.</i>	24	25	13	30	92	3%	23.0	7.2
<i>Rheotanytarsus sp.</i>	12	4	4	15	35	1%	8.8	5.6
<i>Micropsectra spp.</i>	2	6	4	4	16	1%	4.0	1.6
<i>Antocha sp.</i>	0	0	4	1	5	0%	1.3	1.9
<i>Hexatoma sp.</i>	1	0	0	0	1	0%	0.3	0.5
<i>Atherix pachypus</i>	6	10	7	9	32	1%	8.0	1.8
<i>Simulium (Eusimulium)</i>	17	12	3	30	62	2%	15.5	11.3
EPHEMEROPTERA						16%	110	
<i>Acentrella insignicans</i>	39	29	24	41	133	5%	33.3	8.1
<i>Baetis tricaudatus</i>	51	24	26	49	150	5%	37.5	14.5
<i>Diphetor hageni</i>	1	5	2	2	10	0%	2.5	1.7
<i>Attenella margarita</i>	2	1	3	2	8	0%	2.0	0.8
<i>Serratella tibialis</i>	16	11	12	7	46	2%	11.5	3.7
<i>Drunella grandis</i>	6	5	1	2	14	0%	3.5	2.4
<i>Epeorus albertae</i>	3	0	0	1	4	0%	1.0	1.4
<i>Heptagenia sp.</i>	8	7	4	12	31	1%	7.8	3.3
<i>Nixe sp.</i>	2	2	5	0	9	0%	2.3	2.1
<i>Rhithrogena sp.</i>	1	1	3	2	7	0%	1.8	1.0
<i>Paraleptophlebia bicornuta</i>	0	4	0	0	4	0%	1.0	2.0
<i>Paraleptophlebia sp.</i>	0	1	1	2	4	0%	1.0	0.8
<i>Tricorythodes minutus</i>	8	6	4	1	19	1%	4.8	3.0

B.19 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Shuffield's - STATION 18 - 21 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
PLECOPTERA						1%	9	
<i>Claassenia sabulosa</i>	1	3	2	1	7	0%	1.8	1.0
<i>Calineuria californica</i>	1	1	0	0	2	0%	0.5	0.6
<i>Hesperoperla pacifica</i>	2	4	0	0	6	0%	1.5	1.9
<i>Malenka sp.</i>	2	0	0	1	3	0%	0.8	1.0
<i>Isogenoides sp.</i>	0	1	1	1	3	0%	0.8	0.5
<i>Skwala sp.</i>	3	3	4	1	11	0%	2.8	1.3
<i>Pteronarcella badia</i>	1	0	0	0	1	0%	0.3	0.5
<i>Pteronarcys californica</i>	1	1	0	1	3	0%	0.8	0.5
TRICHOPTERA						69%	490	
<i>Arctopsyche grandis</i>	43	57	15	30	145	5%	36.3	18.0
<i>Cheumatopsyche spp.</i>	110	110	73	91	384	14%	96.0	17.8
<i>Hydropsyche occidentalis</i>	172	137	52	141	502	18%	125.5	51.4
<i>Hydropsyche cockerelli</i>	265	213	82	229	789	28%	197.3	79.9
<i>Hydroptila spp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Oecetis sp.</i>	0	1	0	0	1	0%	0.3	0.5
<i>Wormaldia sp.</i>	7	7	7	6	27	1%	6.8	0.5
<i>Psychomyia flava</i>	0	0	0	1	1	0%	0.3	0.5
<i>Brachycentrus occidentalis</i>	26	28	7	37	98	3%	24.5	12.6
<i>Rhyacophila sp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Glossosoma sp.</i>	1	1	7	1	10	0%	2.5	3.0
ANNELIDA						0%	2	
Lumbricidae	0	0	1	0	1	0%	0.3	0.5
Lumbriculidae	0	0	1	0	1	0%	0.3	0.5
Tubificidae	4	0	1	0	5	0%	1.3	1.9
ID's by D. McGuire								
TOTAL ORGANISMS	887	740	400	795	2822		706	213
TAXA RICHNESS	41	36	38	41	55		39.0	2.4
SHAN. DIVERSITY	3.52	3.46	3.94	3.57	3.65		3.62	0.22
BIOTIC INDEX	4.26	4.11	4.16	4.28	4.21		4.20	0.08
EPT RICHNESS	25	26	23	24	32		24.5	1.3
% R.A. DOMINANT	30%	29%	21%	29%	28%		27%	4.4%
% R.A. FILTERERS	74%	77%	61%	73%	72%		71%	7%
METALS TOLERANCE	4.17	4.01	4.15	4.18	4.13		4.13	0.08
Baetidae/Ephemeroptera	0.66	0.60	0.61	0.76	0.67		0.66	0.07
Hydropsychinae/Trichoptera	0.88	0.83	0.84	0.86	0.86		0.85	0.02
EPT / (EPT + CHIR.)	0.91	0.93	0.89	0.88	0.90		0.90	0.02

B.20 MACROINVERTEBRATE DATA								
BITTERROOT RIVER near mouth - STATION 19 - 21 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						8%	84	
<i>Optioservus spp.</i>	18	69	8	27	122	3%	30.5	26.8
<i>Zaitzevia sp.</i>	64	91	25	32	212	5%	53.0	30.5
<i>Lara sp.</i>	1	2	0	0	3	0%	0.8	1.0
DIPTERA						19%	199	
<i>Pagastia sp</i>	0	1	0	0	1	0%	0.3	0.5
<i>Cardiocladius spp.</i>	1	5	1	2	9	0%	2.3	1.9
<i>Cricotopus spp.</i>	2	1	2	0	5	0%	1.3	1.0
<i>Eukiefferiella spp.</i>	5	5	5	5	20	0%	5.0	0.0
<i>Eukiefferiella devonica gp.</i>	2	5	0	0	7	0%	1.8	2.4
<i>Orthocladius spp.</i>	7	13	3	3	26	1%	6.5	4.7
<i>Tvetenia sp.</i>	17	24	2	18	61	1%	15.3	9.4
<i>Polypedilum spp.</i>	26	25	15	22	88	2%	22.0	5.0
<i>Rheotanytarsus sp.</i>	23	32	18	17	90	2%	22.5	6.9
<i>Antocha sp.</i>	3	9	6	4	22	1%	5.5	2.6
<i>Atherix pachypus</i>	2	5	1	2	10	0%	2.5	1.7
<i>Simulium (Eusimulium)</i>	49	198	126	60	433	10%	108.3	68.8
<i>Chelifera sp.</i>	4	10	7	3	24	1%	6.0	3.2
EPHEMEROPTERA						2%	26	
<i>Acentrella insignificans</i>	2	0	1	0	3	0%	0.8	1.0
<i>Baetis tricaudatus</i>	15	32	5	16	68	2%	17.0	11.2
<i>Attenella margarita</i>	0	1	0	1	2	0%	0.5	0.6
<i>Serratella tibialis</i>	5	6	1	3	15	0%	3.8	2.2
<i>Drunella grandis</i>	0	0	0	1	1	0%	0.3	0.5
<i>Rhithrogena sp.</i>	0	3	3	0	6	0%	1.5	1.7
<i>Tricorythodes minutus</i>	0	8	0	0	8	0%	2.0	4.0
LEPIDOPTERA								
<i>Petrophila sp.</i>	1	0	0	1	2	0%	0.5	0.6
PLECOPTERA						4%	41	
<i>Claassenia sabulosa</i>	2	8	2	0	12	0%	3.0	3.5
<i>Hesperoperla pacifica</i>	0	2	0	0	2	0%	0.5	1.0
<i>Calineuria californica</i>	0	1	0	0	1	0%	0.3	0.5
<i>Isogenoides sp.</i>	2	2	3	1	8	0%	2.0	0.8
<i>Skwala sp.</i>	4	13	12	3	32	1%	8.0	5.2
<i>Pteronarcella badia</i>	36	29	14	29	108	3%	27.0	9.3
<i>Pteronarcys californica</i>	1	0	0	0	1	0%	0.3	0.5

B.20 MACROINVERTEBRATE DATA								
BITTERROOT RIVER near mouth - STATION 19 - 21 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TRICHOPTERA						66%	695	
<i>Arctopsyche grandis</i>	24	31	5	11	71	2%	17.8	11.9
<i>Cheumatopsyche spp.</i>	140	267	76	188	671	16%	167.8	80.5
<i>Hydropsyche occidentalis</i>	423	431	210	404	1468	35%	367.0	105.3
<i>Hydropsyche cockerelli</i>	32	71	21	36	160	4%	40.0	21.6
<i>Limnephilus sp.</i>	1	0	0	1	2	0%	0.5	0.6
<i>Hydroptila spp.</i>	1	1	2	0	4	0%	1.0	0.8
<i>Ceraclea sp.</i>	2	0	0	1	3	0%	0.8	1.0
<i>Oecetis sp.</i>	0	1	0	1	2	0%	0.5	0.6
<i>Brachycentrus americanus</i>	0	4	1	0	5	0%	1.3	1.9
<i>Brachycentrus occidentalis</i>	27	25	8	12	72	2%	18.0	9.4
<i>Rhyacophila sp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Glossosoma sp.</i>	57	79	77	108	321	8%	80.3	21.0
ANNELIDA						1%	10	
Lumbricidae	6	16	3	9	34	1%	8.5	5.6
Lumbriculidae	1	1	0	0	2	0%	0.5	0.6
Tubificidae	0	1	0	0	1	0%	0.3	0.5
Glossiphoniidae	0	1	0	0	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	1006	1529	664	1021	4220		1055	356
TAXA RICHNESS	35	40	31	30	47		34.0	4.5
SHAN. DIVERSITY	3.23	3.59	3.29	3.06	3.40		3.29	0.22
BIOTIC INDEX	4.40	4.43	4.22	4.28	4.35		4.33	0.10
EPT RICHNESS	17	20	17	16	26		17.5	1.7
% R.A. DOMINANT	42%	28%	32%	40%	35%		35%	6.5%
% R.A. FILTERERS	71%	69%	70%	71%	70%		70%	1%
METALS TOLERANCE	4.41	4.44	4.33	4.39	4.41		4.40	0.05
Baetidae/Ephemeroptera	0.77	0.64	0.60	0.76	0.69		0.69	0.09
Hydropsychinae/Trichoptera	0.84	0.85	0.77	0.83	0.83		0.82	0.04
EPT / (EPT + CHIR.)	0.90	0.90	0.91	0.92	0.91		0.91	0.01

B.21 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Harper Bridge - STATION 20 - 21 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						2%	16	
<i>Optioservus</i> spp.	16	7	12	12	47	1%	11.8	3.7
<i>Zaitzevia</i> sp.	5	1	5	4	15	0%	3.8	1.9
DIPTERA						17%	153	
<i>Thienemannimyia</i> gp.	0	1	2	1	4	0%	1.0	0.8
<i>Cardiocladius</i> spp.	4	0	0	0	4	0%	1.0	2.0
<i>Cricotopus</i> spp.	22	18	23	16	79	2%	19.8	3.3
<i>Eukiefferiella</i> spp.	2	0	7	1	10	0%	2.5	3.1
<i>Eukiefferiella devonica</i> gp.	1	3	7	0	11	0%	2.8	3.1
<i>Orthocladius</i> spp.	16	13	19	31	79	2%	19.8	7.9
<i>Tvetenia</i> sp.	6	6	6	9	27	1%	6.8	1.5
<i>Microtendipes</i> sp	0	1	0	0	1	0%	0.3	0.5
<i>Polypedilum</i> spp.	1	9	24	12	46	1%	11.5	9.5
<i>Rheotanytarsus</i> sp.	2	18	6	18	44	1%	11.0	8.2
<i>Micropsectra</i> spp.	2	8	13	6	29	1%	7.3	4.6
<i>Atherix pachypus</i>	24	11	18	10	63	2%	15.8	6.6
<i>Simulium (Eusimulium)</i>	51	10	90	61	212	6%	53.0	33.1
<i>Chelifera</i> sp.	1	1	0	0	2	0%	0.5	0.6
EPHEMEROPTERA						14%	126	
<i>Acentrella insignicans</i>	1	2	0	1	4	0%	1.0	0.8
<i>Baetis tricaudatus</i>	92	59	138	91	380	11%	95.0	32.5
<i>Diphetor hageni</i>	1	1	4	4	10	0%	2.5	1.7
<i>Attenella margarita</i>	7	9	8	11	35	1%	8.8	1.7
<i>Serratella tibialis</i>	4	4	2	4	14	0%	3.5	1.0
<i>Drunella grandis</i>	0	0	1	0	1	0%	0.3	0.5
<i>Epeorus albertae</i>	0	0	0	2	2	0%	0.5	1.0
<i>Nixe</i> sp.	0	3	1	1	5	0%	1.3	1.3
<i>Rhithrogena</i> sp.	4	7	4	6	21	1%	5.3	1.5
<i>Tricorythodes minutus</i>	7	4	10	12	33	1%	8.3	3.5
HEMIPTERA								
<i>Sigara</i> sp.	0	0	1	1	2	0%	0.5	0.6
PLECOPTERA						1%	6	

B.21 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Harper Bridge - STATION 20 - 21 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
<i>Claassenia sabulosa</i>	0	1	1	3	5	0%	1.3	1.3
<i>Hesperoperla pacifica</i>	1	3	1	1	6	0%	1.5	1.0
<i>Calineuria californica</i>	0	1	0	0	1	0%	0.3	0.5
<i>Isogenoides sp.</i>	0	0	1	1	2	0%	0.5	0.6
<i>Skwala sp.</i>	0	1	0	1	2	0%	0.5	0.6
<i>Pteronarcella badia</i>	1	0	4	0	5	0%	1.3	1.9
<i>Pteronarcys californica</i>	0	0	1	0	1	0%	0.3	0.5
<i>Zapada cinctipes</i>	1	0	0	0	1	0%	0.3	0.5
TRICHOPTERA						66%	580	
<i>Arctopsyche grandis</i>	11	13	16	10	50	1%	12.5	2.6
<i>Cheumatopsyche spp.</i>	24	56	90	69	239	7%	59.8	27.6
<i>Hydropsyche occidentalis</i>	425	362	525	443	1755	50%	438.8	67.2
<i>Hydropsyche cockerelli</i>	44	25	56	44	169	5%	42.3	12.8
<i>Hydroptila spp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Brachycentrus occidentalis</i>	3	6	6	5	20	1%	5.0	1.4
<i>Glossosoma sp.</i>	6	27	16	37	86	2%	21.5	13.4
ANNELIDA						0%	1	
Lumbriculidae	1	0	0	0	1	0%	0.3	0.5
Naididae	1	1	1	0	3	0%	0.8	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	787	692	1119	929	3527		882	186
TAXA RICHNESS	32	33	34	33	44		33.0	0.8
SHAN. DIVERSITY	2.71	2.94	2.99	3.04	2.99		2.92	0.15
BIOTIC INDEX	4.65	4.54	4.69	4.57	4.62		4.61	0.07
EPT RICHNESS	16	18	19	20	25		18.3	1.7
% R.A. DOMINANT	54%	52%	47%	48%	50%		50%	3.5%
% R.A. FILTERERS	71%	71%	71%	70%	71%		71%	1%
METALS TOLERANCE	4.87	4.53	4.76	4.58	4.69		4.68	0.16
Baetidae/Ephemeroptera	0.81	0.70	0.85	0.73	0.78		0.77	0.07
Hydropsychinae/Trichoptera	0.96	0.91	0.95	0.91	0.93		0.93	0.03
EPT / (EPT + CHIR.)	0.92	0.88	0.89	0.89	0.90		0.90	0.02

B.22

MACROINVERTEBRATE DATA

CLARK FORK RIVER at Huson - STATION 22 - 21 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						2%	12	
<i>Optioservus spp.</i>	0	3	16	18	37	2%	9.3	9.1
<i>Zaitzevia sp.</i>	0	2	4	3	9	0%	2.3	1.7
DIPTERA						38%	180	
<i>Thienemannimyia gp.</i>	0	0	1	1	2	0%	0.5	0.6
<i>Cardiocladius spp.</i>	1	0	3	1	5	0%	1.3	1.3
<i>Cricotopus spp.</i>	3	1	20	7	31	2%	7.8	8.5
<i>Eukiefferiella spp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Orthocladius spp.</i>	3	1	15	9	28	1%	7.0	6.3
<i>Tvetenia sp.</i>	0	0	7	4	11	1%	2.8	3.4
<i>Polypedilum spp.</i>	11	8	37	45	101	5%	25.3	18.5
<i>Cladotanytarsus sp.</i>	1	1	9	10	21	1%	5.3	4.9
<i>Rheotanytarsus sp.</i>	4	1	6	14	25	1%	6.3	5.6
<i>Micropsectra spp.</i>	0	0	16	35	51	3%	12.8	16.6
<i>Atherix pachypus</i>	2	1	1	6	10	1%	2.5	2.4
<i>Hexatoma sp.</i>	0	0	0	2	2	0%	0.5	1.0
<i>Simulium spp.</i>	10	6	228	182	426	22%	106.5	115.3
<i>Chelifera sp.</i>	0	0	0	4	4	0%	1.0	2.0
EPHEMEROPTERA						15%	72	
<i>Acentrella insignicans</i>	1	1	0	1	3	0%	0.8	0.5
<i>Baetis tricaudatus</i>	29	11	77	83	200	11%	50.0	35.5
<i>Diphetor hageni</i>	4	1	1	3	9	0%	2.3	1.5
<i>Attenella margarita</i>	6	3	3	13	25	1%	6.3	4.7
<i>Drunella grandis</i>	0	0	1	0	1	0%	0.3	0.5
<i>Nixe sp.</i>	1	1	0	3	5	0%	1.3	1.3
<i>Rhithrogena sp.</i>	3	5	11	3	22	1%	5.5	3.8
<i>Paraleptophlebia bicornuta</i>	0	0	2	0	2	0%	0.5	1.0
<i>Tricorythodes minutus</i>	5	1	6	8	20	1%	5.0	2.9
PLECOPTERA						2%	10	
<i>Claassenia sabulosa</i>	3	6	8	0	17	1%	4.3	3.5
<i>Hesperoperla pacifica</i>	1	0	3	0	4	0%	1.0	1.4
<i>Malenka sp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Isogenoides sp.</i>	1	0	2	5	8	0%	2.0	2.2
<i>Skwala sp.</i>	0	0	5	1	6	0%	1.5	2.4
<i>Pteronarcella badia</i>	1	0	1	0	2	0%	0.5	0.6
<i>Pteronarcys californica</i>	0	0	1	0	1	0%	0.3	0.5

B.22 MACROINVERTEBRATE DATA								
CLARK FORK RIVER at Huson - STATION 22 - 21 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TRICHOPTERA						43%	203	
<i>Arctopsyche grandis</i>	0	0	3	4	7	0%	1.8	2.1
<i>Cheumatopsyche spp.</i>	18	15	28	75	136	7%	34.0	27.9
<i>Hydropsyche occidentalis</i>	22	34	233	323	612	32%	153.0	149.0
<i>Hydropsyche cockerelli</i>	3	2	10	8	23	1%	5.8	3.9
<i>Brachycentrus occidentalis</i>	0	0	2	1	3	0%	0.8	1.0
<i>Glossosoma sp.</i>	2	2	8	18	30	2%	7.5	7.5
ANNELIDA						0%	0	
Naididae	0	0	0	1	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	135	106	770	891	1902		476	413
TAXA RICHNESS	23	21	34	31	39		27.3	6.2
SHAN. DIVERSITY	3.70	3.41	3.17	3.14	3.32		3.35	0.26
BIOTIC INDEX	4.59	4.50	5.07	4.97	4.96		4.78	0.28
EPT RICHNESS	15	12	20	15	22		15.5	3.3
% R.A. DOMINANT	21%	32%	30%	36%	32%		30%	6.2%
% R.A. FILTERERS	42%	55%	66%	68%	65%		58%	12%
METALS TOLERANCE	4.47	4.45	5.03	4.72	4.81		4.67	0.27
Baetidae/Ephemeroptera	0.69	0.57	0.77	0.76	0.74		0.70	0.10
Hydropsychinae/Trichoptera	0.96	0.96	0.95	0.95	0.95		0.95	0.01
EPT / (EPT + CHIR.)	0.81	0.87	0.78	0.81	0.80		0.82	0.04

B. 23

MACROINVERTEBRATE DATA

CLARK FORK RIVER nr Superior - STATION 24 - 20 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						2%	22	
<i>Optioservus</i> spp.	15	10	17	6	48	1%	12.0	5.0
<i>Zaitzevia</i> sp.	16	9	9	4	38	1%	9.5	4.9
DIPTERA						11%	98	
<i>Thienemannimyia</i> gp.	0	1	2	1	4	0%	1.0	0.8
<i>Pagastia</i> sp	0	0	1	0	1	0%	0.3	0.5
<i>Cardiocladius</i> spp.	1	1	2	1	5	0%	1.3	0.5
<i>Cricotopus</i> spp.	3	0	2	4	9	0%	2.3	1.7
<i>Eukiefferiella</i> spp.	1	0	0	1	2	0%	0.5	0.6
<i>Eukiefferiella devonica</i> gp.	0	0	3	2	5	0%	1.3	1.5
<i>Orthocladius</i> spp.	19	7	3	3	32	1%	8.0	7.6
<i>Synorthocladius</i> sp.	1	0	1	0	2	0%	0.5	0.6
<i>Tvetenia</i> sp.	0	1	2	8	11	0%	2.8	3.6
<i>Microtendipes</i> sp	4	0	0	3	7	0%	1.8	2.1
<i>Polypedilum</i> spp.	25	16	21	19	81	2%	20.3	3.8
<i>Cladotanytarsus</i> sp.	6	1	1	2	10	0%	2.5	2.4
<i>Rheotanytarsus</i> sp.	0	2	4	2	8	0%	2.0	1.6
<i>Micropsectra</i> spp.	11	5	1	12	29	1%	7.3	5.2
<i>Atherix pachypus</i>	0	0	0	1	1	0%	0.3	0.5
<i>Simulium</i> (<i>Eusimulium</i>)	10	93	50	31	184	5%	46.0	35.3
EPHEMEROPTERA						5%	45	
<i>Acentrella insignifcans</i>	10	5	17	5	37	1%	9.3	5.7
<i>Baetis tricaudatus</i>	9	7	27	31	74	2%	18.5	12.3
<i>Diphetor hageni</i>	1	0	0	0	1	0%	0.3	0.5
<i>Attenella margarita</i>	1	0	2	0	3	0%	0.8	1.0
<i>Serratella tibialis</i>	8	2	6	15	31	1%	7.8	5.4
<i>Drunella grandis</i>	0	0	0	2	2	0%	0.5	1.0
<i>Epeorus albertae</i>	2	2	0	7	11	0%	2.8	3.0
<i>Rhithrogena</i> sp.	5	7	8	1	21	1%	5.3	3.1
PLECOPTERA						2%	16	
<i>Claassenia sabulosa</i>	7	22	23	6	58	2%	14.5	9.3
<i>Hesperoperla pacifica</i>	1	0	1	1	3	0%	0.8	0.5
<i>Isogenoides</i> sp.	0	0	2	0	2	0%	0.5	1.0
<i>Pteronarcys californica</i>	1	0	1	0	2	0%	0.5	0.6

B. 23

MACROINVERTEBRATE DATA

CLARK FORK RIVER nr Superior - STATION 24 - 20 AUG 96

Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
TRICHOPTERA						79%	692	
<i>Arctopsyche grandis</i>	2	0	1	2	5	0%	1.3	1.0
<i>Cheumatopsyche spp.</i>	455	333	341	323	1452	42%	363.0	61.8
<i>Hydropsyche occidentalis</i>	230	125	267	236	858	25%	214.5	61.8
<i>Hydropsyche cockerelli</i>	67	21	61	61	210	6%	52.5	21.2
<i>Hydropsyche oslari ?</i>	0	0	0	2	2	0%	0.5	1.0
<i>Brachycentrus americanus</i>	0	0	0	1	1	0%	0.3	0.5
<i>Brachycentrus occidentalis</i>	3	0	1	2	6	0%	1.5	1.3
<i>Rhyacophila coloradensis</i>	0	0	1	0	1	0%	0.3	0.5
<i>Glossosoma sp.</i>	62	47	69	56	234	7%	58.5	9.3
ANNELIDA						0%	0	
Lumbricidae	0	0	0	1	1	0%	0.3	0.5
ID's by D. McGuire								
TOTAL ORGANISMS	976	717	947	852	3492		873	117
TAXA RICHNESS	28	21	31	33	40		28.3	5.3
SHAN. DIVERSITY	2.61	2.60	2.87	2.86	2.82		2.74	0.15
BIOTIC INDEX	4.54	4.52	4.41	4.46	4.48		4.48	0.06
EPT RICHNESS	16	10	16	16	21		14.5	3.0
% R.A. DOMINANT	47%	46%	36%	38%	42%		42%	5.6%
% R.A. FILTERERS	79%	80%	77%	77%	78%		78%	2%
METALS TOLERANCE	4.55	4.58	4.54	4.51	4.54		4.55	0.03
Baetidae/Ephemeroptera	0.56	0.52	0.73	0.59	0.62		0.60	0.09
Hydropsychinae/Trichoptera	0.92	0.91	0.90	0.91	0.91		0.91	0.01
EPT / (EPT + CHIR.)	0.92	0.94	0.95	0.93	0.94		0.94	0.01

B.24 MACROINVERTEBRATE DATA								
CLARK FORK RIVER above Flathead River - STATION 25 - 20 AUG 96								
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.
COLEOPTERA						1%	4	
<i>Optioservus spp.</i>	0	0	0	3	3	0%	0.8	1.5
<i>Zaitzevia sp.</i>	0	0	5	8	13	0%	3.3	3.9
DIPTERA						33%	241	
<i>Thienemannimyia gp.</i>	0	1	4	0	5	0%	1.3	1.9
<i>Potthastia gaedii gp.</i>	0	2	0	5	7	0%	1.8	2.4
<i>Cardiocladius spp.</i>	4	0	5	0	9	0%	2.3	2.6
<i>Cricotopus spp.</i>	4	2	1	0	7	0%	1.8	1.7
<i>Eukiefferiella spp.</i>	3	1	0	1	5	0%	1.3	1.3
<i>Eukiefferiella devonica gp.</i>	0	0	1	0	1	0%	0.3	0.5
<i>Orthocladius spp.</i>	16	23	37	14	90	3%	22.5	10.4
<i>Tvetenia sp.</i>	13	6	10	13	42	1%	10.5	3.3
<i>Microtendipes sp</i>	0	2	4	23	29	1%	7.3	10.6
<i>Polypedilum spp.</i>	8	10	16	12	46	2%	11.5	3.4
<i>Xenochironomus sp.</i>	1	5	8	6	20	1%	5.0	2.9
<i>Cladotanytarsus sp.</i>	1	3	2	0	6	0%	1.5	1.3
<i>Rheotanytarsus sp.</i>	159	120	136	204	619	21%	154.8	36.5
<i>Tanytarsus sp.</i>	0	0	0	1	1	0%	0.3	0.5
<i>Micropsectra spp.</i>	8	8	11	39	66	2%	16.5	15.1
<i>Antocha sp.</i>	0	0	2	1	3	0%	0.8	1.0
<i>Atherix pachypus</i>	0	1	0	0	1	0%	0.3	0.5
<i>Simulium (Eusimulium)</i>	0	2	5	0	7	0%	1.8	2.4
EPHEMEROPTERA						8%	59	
<i>Acentrella insignifcans</i>	20	18	19	21	78	3%	19.5	1.3
<i>Baetis tricaudatus</i>	2	2	5	1	10	0%	2.5	1.7
<i>Attenella margarita</i>	3	4	6	4	17	1%	4.3	1.3
<i>Serratella tibialis</i>	0	0	2	2	4	0%	1.0	1.2
<i>Ephemerella inermis</i>	0	0	1	0	1	0%	0.3	0.5
<i>Drunella grandis</i>	0	0	1	0	1	0%	0.3	0.5
<i>Epeorus albertae</i>	8	0	5	7	20	1%	5.0	3.6
<i>Heptagenia sp.</i>	11	8	32	23	74	3%	18.5	11.1
<i>Nixe sp.</i>	1	4	0	0	5	0%	1.3	1.9
<i>Rhithrogena sp.</i>	1	1	0	0	2	0%	0.5	0.6
<i>Paraleptophlebia bicornuta</i>	2	5	5	6	18	1%	4.5	1.7
<i>Paraleptophlebia sp.</i>	1	0	2	1	4	0%	1.0	0.8
LEPIDOPTERA								
<i>Petrophila sp.</i>	0	0	5	1	6	0%	1.5	2.4
PLECOPTERA						0%	3	

B.24 MACROINVERTEBRATE DATA									
CLARK FORK RIVER above Flathead River - STATION 25 - 20 AUG 96									
Taxon	sample1	sample2	sample3	sample4	SUM	%RA	MEAN	S. D.	
<i>Claassenia sabulosa</i>	1	0	0	1	2	0%	0.5	0.6	
<i>Hesperoperla pacifica</i>	1	0	0	0	1	0%	0.3	0.5	
<i>Isogenoides sp.</i>	3	2	1	2	8	0%	2.0	0.8	
<i>Skwala sp.</i>	0	1	0	0	1	0%	0.3	0.5	
TRICHOPTERA						58%	427		
<i>Arctopsyche grandis</i>	2	1	5	3	11	0%	2.8	1.7	
<i>Cheumatopsyche spp.</i>	144	157	222	396	919	31%	229.8	116.0	
<i>Hydropsyche occidentalis</i>	51	17	95	91	254	9%	63.5	36.8	
<i>Hydropsyche cockerelli</i>	89	70	151	139	449	15%	112.3	38.9	
<i>Hydropsyche oslari ?</i>	1	0	0	0	1	0%	0.3	0.5	
<i>Hydroptila spp.</i>	4	1	10	1	16	1%	4.0	4.2	
<i>Leucotrichia pictipes</i>	2	2	2	1	7	0%	1.8	0.5	
<i>Zumatrixchia notosa</i>	4	3	0	0	7	0%	1.8	2.1	
<i>Ceraclea sp.</i>	4	1	17	10	32	1%	8.0	7.1	
<i>Oecetis sp.</i>	0	0	2	0	2	0%	0.5	1.0	
<i>Psychomyia flava</i>	2	1	1	0	4	0%	1.0	0.8	
<i>Brachycentrus occidentalis</i>	1	0	1	2	4	0%	1.0	0.8	
<i>Glossosoma sp.</i>	0	0	3	0	3	0%	0.8	1.5	
ANNELIDA						0%	2		
Lumbricidae	0	2	3	0	5	0%	1.3	1.5	
Naididae	1	0	0	0	1	0%	0.3	0.5	
Tubificidae	1	0	0	2	3	0%	0.8	1.0	
MOLLUSCA						0%	1		
Sphaeriidae	0	0	2	1	3	0%	0.8	1.0	
OTHER									
Porifera	1	1	1	1	4	0%	1.0	0.0	
ID's by D. McGuire									
TOTAL ORGANISMS	578	487	846	1046	2957		739	255	
TAXA RICHNESS	36	34	41	35	55		36.5	3.1	
SHAN. DIVERSITY	3.23	3.15	3.51	2.99	3.32		3.22	0.22	
BIOTIC INDEX	4.97	4.97	4.81	4.91	4.90		4.92	0.07	
EPT RICHNESS	23	18	22	18	29		20.3	2.6	
% R.A. DOMINANT	28%	32%	26%	38%	31%		31%	5.3%	
% R.A. FILTERERS	77%	75%	73%	80%	77%		76%	3%	
METALS TOLERANCE	3.34	3.36	3.56	3.60	3.50		3.46	0.13	
Baetidae/Ephemeroptera	0.45	0.48	0.31	0.34	0.38		0.39	0.08	
Hydropsychinae/Trichoptera	0.94	0.96	0.92	0.97	0.95		0.95	0.02	
EPT / (EPT + CHIR.)	0.62	0.62	0.71	0.69	0.67		0.66	0.05	

B.25

MACROINVERTEBRATE DATA

CLARK FORK RIVER above Thompson Falls Reservoir -STATION 27 -20 AUG 96

NOT QUANTITATIVE DATA - samples from recently inundated or frequently dewatered areas.

APPENDIX C:

Metric values and bioassessment scores for Clark Fork Basin monitoring stations, 1986-1996

C-1. Mean metric values and bioassessment scores for Blacktail Creek above Grove Gulch: Station SF-1, August, 1993-1996 (4 Hess samples per year).

	1993	1994	1995	1996	Mean
Metric values					
Taxa richness	30	35	31	27	31
Shannon diversity	1.9	3.3	3.0	3.0	2.8
EPT/EPTC	0.20	0.76	0.54	0.87	0.59
Hydropsychinae/Trichoptera	0.58	0.97	1.00	0.99	0.89
Baetidae/Ephemeroptera	0.40	0.92	0.90	0.94	0.79
Biotic index	6.3	4.3	4.1	4.1	4.7
% Filterer	67	47	57	65	59
Density	1648	1670	2566	1147	1758
EPT richness	10	13	10	12	11
Metals Tolerance index	6.6	6.0	5.5	6.0	6.0
Metric scores					
Taxa richness	4	5	4	3	4
Shannon diversity	2	5	5	5	4
EPT/EPTC	2	6	5	6	5
Hydropsychinae/Trichoptera	6	1	0	1	2
Baetidae/Ephemeroptera	6	3	4	2	4
Biotic index	2	5	5	5	4
% Filterer	2	6	4	3	4
Density (high)	6	6	5	6	6
Density (low)	6	6	6	6	6
EPT richness	3	3	3	3	3
Metals Tolerance index	3	3	4	3	3
Total	42	49	45	43	45
Organic subset	10	17	14	14	14
Metals subset	12	12	13	12	12
Bioassessment					
Overall	64%	74%	68%	65%	68%
Organic subset	56%	94%	78%	78%	76%
Metals subset	67%	67%	72%	67%	68%

C-2. Mean metric values and bioassessment scores for Silver Bow Creek above the Butte WWTP: Station 00 - August, 1987-1996 (four Hess samples per year).

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values											
Taxa richness	5	6	6	7	9	10	8	14	10	12	9
Shannon diversity	1.6	2.3	0.9	1.4	1.8	1.4	1.7	1.7	1.8	2.1	1.7
EPT/EPTC	0.03	0.03	0.00	0.00	0.01	0.01	0.00	0.02	0.01	0.14	0.03
Hydropsychinae/Trichoptera	1.00	0.75	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97
Baetidae/Ephemeroptera	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.90
Biotic index	4.9	5.1	6.6	5.7	4.9	6.3	5.0	5.7	5.4	5.2	5.5
% Filterer	0	2	1	0	0	0	1	2	1	13	2
Density	26	46	175	362	344	167	247	607	278	367	262
EPT richness	0	1	0	1	1	1	1	2	1	3	1
Metals Tolerance index	9.3	9.2	9.7	9.4	9.2	9.3	9.4	9.4	9.1	8.9	9.3
Metric scores											
Taxa richness	0	0	0	0	0	0	0	0	0	0	0
Shannon diversity	1	3	0	0	2	0	1	1	2	2	1
EPT/EPTC	0	0	0	0	0	0	0	0	0	1	0
Hydropsychinae/Trichoptera	0	6	0	0	0	0	0	0	2	0	1
Baetidae/Ephemeroptera	0	0	0	0	6	0	0	0	0	0	1
Biotic index	4	4	1	3	4	2	4	3	3	3	3
% Filterer	6	6	6	6	6	6	6	6	6	6	6
Density (high)	*	*	*	*	*	*	*	6	*	*	6
Density (low)	0	0	2	4	3	2	2	6	3	4	3
EPT richness	0	0	0	0	0	0	0	1	0	1	0
Metals Tolerance index	0	0	0	0	0	0	0	0	0	1	0
Total	11	19	9	13	21	10	13	23	16	18	15
Organic subset	10	10	7	9	10	8	10	15	9	9	10
Metals subset	0	0	2	4	3	2	2	7	3	6	3
Bioassessment											
Overall	18%	32%	15%	22%	35%	17%	22%	35%	27%	30%	25%
Organic subset	83%	83%	58%	75%	83%	67%	83%	83%	75%	75%	77%
Metals subset	0%	0%	11%	22%	17%	11%	11%	39%	17%	33%	16%

* not calculated if density is < 550

C.3. Mean metric values and bioassessment scores for Silver Bow Creek below the Butte WWTP: Station 01 - August, 1986-1996 (four Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	7	6	11	5	7	11	11	11	8	11	9	9
Shannon diversity	1.1	1.7	1.5	1.0	1.2	2.1	2.0	1.2	0.7	1.9	1.1	1.4
EPT/EPTC	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydropsychinae/Trichoptera	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Baetidae/Ephemeroptera	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
Biotic index	6.9	6.3	6.0	6.9	6.8	6.5	7.4	6.9	7.1	6.0	6.9	6.7
% Filterer	55	3	59	73	69	28	51	77	87	2	57	51
Density	628	118	1450	361	1763	473	315	2663	882	426	1588	970
EPT richness	1	1	1	0	0	0	0	0	0	0	0	0
Metals Tolerance index	8.3	9.3	7.8	7.7	7.8	8.9	7.8	7.5	7.2	8.9	8.3	8.1
Metric scores												
Taxa richness	0	0	0	0	0	0	0	0	0	0	0	0
Shannon diversity	0	1	1	0	0	2	2	0	0	2	0	1
EPT/EPTC	0	0	0	0	0	0	0	0	0	0	0	0
Hydropsychinae/Trichoptera	0	0	0	0	0	0	0	0	0	0	0	0
Baetidae/Ephemeroptera	6	0	0	0	0	0	0	0	0	0	0	1
Biotic index	1	2	2	1	1	1	0	1	0	2	1	1
% Filterer	5	6	4	1	2	6	5	0	0	6	4	4
Density (high)	6	*	6	*	6	*	*	4	6	*	6	6
Density (low)	6	1	6	4	6	5	3	6	6	4	6	5
EPT richness	0	0	0	0	0	0	0	0	0	0	0	0
Metals Tolerance index	1	0	2	2	2	1	2	2	2	1	1	1
Total	25	10	21	8	17	15	12	13	14	15	18	18
Organic subset	12	8	12	2	9	7	5	5	6	8	11	10
Metals subset	7	1	8	6	8	6	5	8	8	5	7	6
Bioassessment												
Overall	38%	17%	32%	13%	26%	25%	20%	20%	21%	25%	27%	24%
Organic subset	67%	67%	67%	17%	50%	58%	42%	28%	33%	67%	61%	51%
Metals subset	39%	6%	44%	33%	44%	33%	28%	44%	44%	28%	39%	35%

* not calculated if density is < 550

C-4. Mean metric values and bioassessment scores for Silver Bow Creek near Opportunity: Station 02.5* - August 1986-1996 (four Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	9	11	14	11	8	11	16	13	14	10	19	12
Shannon diversity	2.1	2.3	2.1	2.6	2.2	2.3	2.9	1.7	2.3	2.2	2.4	2.3
EPT/EPTC	0.63	0.27	0.74	0.44	0.52	0.51	0.75	0.11	0.65	0.18	0.66	0.50
Hydropsychinae/Trichoptera	0.98	0.87	0.98	0.86	0.89	0.89	0.98	0.93	0.16	0.66	0.99	0.84
Baetidae/Ephemeroptera	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	1.00	1.00	0.95	0.97
Biotic index	4.0	4.9	5.4	3.8	4.3	4.7	4.6	4.3	4.1	4.5	3.6	4.4
% Filterer	53	21	73	39	51	51	71	12	77	18	62	48
Density	82	120	378	189	147	220	396	399	640	157	321	277
EPT richness	3	3	5	5	3	4	7	4	5	3	8	5
Metals Tolerance index	7.0	8.0	6.7	7.5	7.4	7.5	6.0	8.6	6.2	8.3	6.8	7.3
Metric scores												
Taxa richness	0	0	0	0	0	0	1	0	0	0	1	0
Shannon diversity	2	3	2	4	3	3	4	1	3	3	3	3
EPT/EPTC	6	3	6	4	5	5	6	1	6	2	6	5
Hydropsychinae/Trichoptera	1	5	1	5	4	4	1	3	6	6	1	3
Baetidae/Ephemeroptera	0	0	0	0	0	0	0	6	0	0	2	1
Biotic index	5	4	3	6	5	4	4	5	5	5	6	5
% Filterer	5	6	1	6	5	5	1	6	0	6	3	4
Density (high)	*	*	*	*	*	*	*	*	6	*	*	6
Density (low)	1	1	4	2	1	2	4	4	6	2	3	3
EPT richness	1	1	1	1	1	1	2	1	1	1	2	1
Metals Tolerance index	2	1	3	2	2	2	3	1	3	1	3	2
Total	23	24	21	30	26	26	26	28	36	26	30	27
Organic subset	10	10	4	12	10	9	5	11	11	11	9	9
Metals subset	4	3	8	5	4	5	9	6	10	4	8	6
Bioassessment												
Overall	38%	40%	35%	50%	43%	43%	43%	47%	55%	43%	50%	44%
Organic subset	83%	83%	33%	100%	83%	75%	42%	92%	61%	92%	75%	74%
Metals subset	22%	17%	44%	28%	22%	28%	50%	33%	56%	22%	44%	33%

1986- 1992 data from Station 03.

* not calculated if density is < 550

C-5. Mean metric values and bioassessment scores for Silver Bow Creek below Warm Springs Ponds: Station 04.5* - August, 1986-1996 (4 samples per year).

	1986	1987	1988	1989	1990	1991	1993	1994	1995	1996	Mean
Metric values											
Taxa richness	16	16	18	16	13	16	29	30	27	30	21
Shannon diversity	2.4	1.6	2.5	2.7	2.1	1.9	3.0	3.2	2.9	2.5	2.5
EPT/EPTC	0.96	0.98	0.97	0.92	0.99	1.00	0.93	0.88	0.74	0.88	0.93
Hydropsychinae/Trichoptera	1.00	1.00	1.00	0.97	1.00	1.00	0.87	0.85	0.90	0.94	0.95
Baetidae/Ephemeroptera	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.90	0.99
Biotic index	6.3	5.1	5.8	5.9	5.0	5.1	5.5	4.8	5.4	5.1	5.4
% Filterer	66	94	75	79	93	90	32	51	58	75	71
Density	2558	1648	2563	2574	3223	1952	940	3018	3609	3090	2518
EPT richness	4	5	4	6	6	5	8	12	8	13	7
Metals Tolerance index	5.1	5.4	5.1	5.8	5.4	5.8	4.6	5.4	6.1	5.2	5.4
Metric scores											
Taxa richness	1	1	1	1	0	1	3	4	3	4	2
Shannon diversity	3	1	3	4	2	2	5	5	4	3	3
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	0	0	0	1	0	0	5	5	4	2	2
Baetidae/Ephemeroptera	0	0	0	0	0	0	0	0	1	4	1
Biotic index	2	4	2	2	4	4	3	4	3	4	3
% Filterer	2	0	1	0	0	0	6	5	4	1	2
Density (high)	5	6	5	5	3	6	6	4	3	4	5
Density (low)	6	6	6	6	6	6	6	6	6	6	6
EPT richness	1	1	1	2	2	1	2	3	2	3	2
Metals Tolerance index	4	4	4	4	4	4	5	4	3	4	4
Total	30	29	29	31	27	30	47	46	39	41	35
Organic subset	9	10	8	7	7	10	15	13	10	9	10
Metals subset	11	11	11	12	12	11	13	13	11	13	12
Bioassessment											
Overall	45%	44%	44%	47%	41%	45%	71%	70%	59%	62%	53%
Organic subset	50%	56%	44%	39%	39%	56%	83%	72%	56%	50%	54%
Metals subset	61%	61%	61%	67%	67%	61%	72%	72%	61%	72%	66%

* 1986-91 data from station 04.

C-6. Mean metric values and bioassessment scores for Warm Springs Creek near mouth: Station 06 - August, 1986-1996 (4 Hess samples per year).

	1986	1987	1988	1989	1990	1991	1993	1994	1995	1996	Mean
Metric values											
Taxa richness	17	24	26	27	29	30	30	32	30	34	28
Shannon diversity	3.3	3.6	3.8	3.5	3.6	3.5	3.1	3.8	3.5	3.9	3.6
EPT/EPTC	0.91	0.66	0.78	0.75	0.60	0.85	0.32	0.64	0.33	0.74	0.66
Hydropsychinae/Trichoptera	0.82	0.69	0.23	0.58	0.86	0.87	0.10	0.75	0.08	0.40	0.54
Baetidae/Ephemeroptera	0.97	0.64	0.12	0.92	0.90	0.53	0.88	0.83	0.92	0.82	0.75
Biotic index	3.7	4.1	5.2	4.5	4.8	4.2	4.2	4.0	4.2	4.1	4.3
% Filterer	20	20	9	20	26	49	34	40	21	39	28
Density	122	277	255	620	486	581	492	759	441	526	456
EPT richness	10	11	13	13	13	14	12	15	13	18	13
Metals Tolerance index	4.5	5.1	3.8	5.2	5.6	4.9	4.5	4.1	4.3	4.4	4.6
Metric scores											
Taxa richness	1	2	3	3	3	4	4	4	4	4	3
Shannon diversity	5	6	6	6	6	6	5	6	6	6	6
EPT/EPTC	6	6	6	6	6	6	3	6	3	6	5
Hydropsychinae/Trichoptera	6	6	6	6	6	6	6	6	6	6	6
Baetidae/Ephemeroptera	1	6	6	3	4	6	4	6	3	6	5
Biotic index	6	5	3	5	4	5	5	5	5	5	5
% Filterer	6	6	6	6	6	6	6	6	6	6	6
Density (high)	*	*	*	6	*	6	*	6	*	*	6
Density (low)	1	3	3	6	5	6	5	6	4	5	4
EPT richness	3	3	3	3	3	4	3	4	3	5	3
Metals Tolerance index	5	4	6	4	4	5	5	5	5	5	5
Total	40	47	48	54	47	60	46	60	45	54	50
Organic subset	12	11	9	17	10	17	11	17	11	11	13
Metals subset	9	10	12	13	12	15	13	15	12	15	13
Bioassessment											
Overall	67%	78%	80%	82%	78%	91%	77%	91%	75%	90%	81%
Organic subset	100%	92%	75%	94%	83%	94%	92%	94%	92%	92%	91%
Metals subset	50%	56%	67%	72%	67%	83%	72%	83%	67%	83%	70%

* not calculated if density is < 550

not sampled in 1992

C-7. Mean metric values and bioassessment scores for Clark Fork River below Warm Springs Creek: Station 07 - August, 1986-1996 (4 Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	25	24	25	23	22	24	25	36	37	35	43	29
Shannon diversity	2.9	2.7	1.5	2.5	2.3	2.4	2.6	3.6	3.2	3.6	2.9	2.7
EPT/EPTC	0.97	0.95	0.98	0.93	0.91	0.94	0.94	0.61	0.85	0.64	0.83	0.87
Hydropsychinae/Trichoptera	1.00	0.90	0.96	0.98	0.99	0.99	0.96	0.95	0.89	0.72	0.95	0.94
Baetidae/Ephemeroptera	1.00	1.00	1.00	1.00	0.99	0.86	1.00	0.46	0.90	0.80	0.84	0.90
Biotic index	4.7	4.7	4.1	4.7	5.0	4.8	4.9	5.2	4.5	5.0	4.9	4.8
% Filterer	65	64	81	58	75	62	54	25	41	27	57	55
Density	847	959	2874	1151	2402	1397	1353	852	2894	2152	2783	1788
EPT richness	10	10	11	10	11	11	12	15	15	16	20	13
Metals Tolerance index	5.0	5.0	4.9	5.0	5.2	5.3	5.0	4.6	4.6	5.6	5.1	5.0
Metric scores												
Taxa richness	3	2	3	2	2	2	3	5	5	5	6	3
Shannon diversity	4	4	1	3	3	3	4	6	5	6	4	4
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	0	4	2	1	1	1	2	2	4	6	2	2
Baetidae/Ephemeroptera	0	0	0	0	1	5	0	6	4	6	6	3
Biotic index	4	4	5	4	4	4	4	3	5	4	4	4
% Filterer	3	3	0	4	1	3	5	6	6	6	4	4
Density (high)	6	6	4	6	5	6	6	6	4	5	4	5
Density (low)	6	6	6	6	6	6	6	6	6	6	6	6
EPT richness	3	3	3	3	3	3	3	4	4	4	5	3
Metals Tolerance index	4	4	5	4	4	4	4	5	5	4	4	4
Total	39	42	35	39	36	43	43	55	54	58	51	45
Organic subset	13	13	9	14	10	13	15	15	15	15	12	13
Metals subset	13	13	14	13	13	13	13	15	15	14	15	14
Bioassessment												
Overall	59%	64%	53%	59%	55%	65%	65%	83%	82%	88%	77%	68%
Organic subset	72%	72%	50%	78%	56%	72%	83%	83%	83%	83%	67%	73%
Metals subset	72%	72%	78%	72%	72%	72%	72%	83%	83%	78%	83%	76%

**C-8. Mean metric values and bioassessment scores for Clark Fork River
at Deer Lodge: Station 09 - August, 1986-1996 (4 Hess samples per year).**

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	24	28	26	32	26	28	28	29	26	26	31	28
Shannon diversity	1.7	2.3	2.3	2.3	2.1	2.9	2.3	3.9	2.2	2.7	2.4	2.5
EPT/EPTC	0.98	0.94	0.77	0.87	0.94	0.91	0.94	0.81	0.95	0.71	0.89	0.88
Hydropsychinae/Trichoptera	1.00	0.95	0.99	0.93	0.96	0.70	0.99	0.73	0.99	0.96	0.98	0.93
Baetidae/Ephemeroptera	0.99	0.93	0.63	0.42	0.78	0.71	0.98	0.68	1.00	0.97	0.99	0.83
Biotic index	4.8	4.9	4.6	5.0	5.0	4.8	5.0	4.9	4.8	5.5	5.1	4.9
% Filterer	77	69	66	67	77	52	78	42	76	71	76	68
Density	1410	1555	3745	2150	3183	909	2283	569	2288	2135	3308	2140
EPT richness	10	14	11	15	13	15	12	13	11	12	16	13
Metals Tolerance index	4.9	5.1	5.5	4.9	5.0	4.7	5.3	4.8	5.1	5.8	5.3	5.1
Metric scores												
Taxa richness	2	3	3	4	3	3	3	3	3	3	4	3
Shannon diversity	1	3	3	3	2	4	3	6	3	4	3	3
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	0	2	1	3	2	6	1	6	1	2	1	2
Baetidae/Ephemeroptera	1	3	6	6	6	6	1	6	0	1	1	3
Biotic index	4	4	4	4	4	4	4	4	4	3	4	4
% Filterer	0	2	2	2	0	5	0	6	0	1	0	2
Density (high)	6	6	3	5	4	6	5	6	5	5	3	5
Density (low)	6	6	6	6	6	6	6	6	6	6	6	6
EPT richness	3	4	3	4	3	4	3	3	3	3	4	3
Metals Tolerance index	5	4	4	5	4	5	4	5	4	4	4	4
Total	34	43	41	48	40	55	36	57	35	38	36	42
Organic subset	10	12	9	11	8	15	9	16	9	9	7	10
Metals subset	14	14	13	15	13	15	13	14	13	13	14	14
Bioassessment												
Overall	52%	65%	62%	73%	61%	83%	55%	86%	53%	58%	55%	64%
Organic subset	56%	67%	50%	61%	44%	83%	50%	89%	50%	50%	39%	58%
Metals subset	78%	78%	72%	83%	72%	83%	72%	78%	72%	72%	78%	76%

C-9. Mean metric values and bioassessment scores for Clark Fork River above Little Blackfoot River: Station 10 - August, 1986-1996 (four Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	23	26	28	20	25	26	30	30	27	34	32	27
Shannon diversity	2.1	2.4	2.4	3.4	3.0	3.3	2.9	4.0	2.8	3.1	2.9	2.9
EPT/EPTC	0.92	0.91	0.62	0.83	0.77	0.91	0.92	0.81	0.91	0.65	0.91	0.83
Hydropsychinae/Trichoptera	0.99	0.94	0.81	0.53	0.73	0.44	0.95	0.60	0.93	0.94	0.93	0.80
Baetidae/Ephemeroptera	0.93	0.81	0.79	0.51	0.72	0.10	0.92	0.48	1.00	0.37	0.96	0.69
Biotic index	5.2	4.9	5.4	5.0	5.7	4.9	4.9	4.9	4.8	5.4	4.9	5.1
% Filterer	78	73	73	32	65	26	66	28	76	55	77	59
Density	3131	974	1688	448	1889	1615	1116	528	2388	3006	2045	1712
EPT richness	11	14	12	11	14	15	15	15	16	16	20	14
Metals Tolerance index	5.3	5.1	5.4	4.9	5.5	4.7	5.2	4.8	5.0	5.5	5.1	5.1
Metric scores												
Taxa richness	2	3	3	2	3	3	4	4	3	4	4	3
Shannon diversity	2	3	3	6	5	5	4	6	4	5	4	4
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	1	2	6	6	6	6	2	6	3	2	3	4
Baetidae/Ephemeroptera	3	6	6	6	6	6	3	6	0	6	2	5
Biotic index	3	4	3	4	3	4	4	4	4	3	4	4
% Filterer	0	1	1	6	3	6	2	6	0	5	0	3
Density (high)	4	6	6	*	6	6	6	*	5	4	5	5
Density (low)	6	6	6	4	6	6	6	5	6	6	6	6
EPT richness	3	4	3	3	4	4	4	4	4	4	5	4
Metals Tolerance index	4	4	4	5	4	5	4	5	4	4	4	4
Total	34	45	47	48	52	57	45	52	39	49	43	47
Organic subset	7	11	10	10	12	16	12	10	9	12	9	12
Metals subset	13	14	13	12	14	15	14	14	14	14	15	14
Bioassessment												
Overall	52%	68%	71%	80%	79%	86%	68%	87%	59%	74%	65%	72%
Organic subset	39%	61%	56%	83%	67%	89%	67%	83%	50%	67%	50%	65%
Metals subset	72%	78%	72%	67%	78%	83%	78%	78%	78%	78%	83%	77%

* not calculated if density is < 550

C-10. Mean metric values and bioassessment scores for Little Blackfoot River: Station 10.2 - August, 1993-1996 (4 Hess samples per year).

	1993	1994	1995	1996	Mean
Metric values					
Taxa richness	40	42	41	39	40
Shannon diversity	3.9	4.2	4.2	3.9	4.0
EPT/EPTC	0.32	0.58	0.55	0.61	0.52
Hydropsychinae/Trichoptera	0.14	0.62	0.38	0.71	0.46
Baetidae/Ephemeroptera	0.30	0.88	0.57	0.48	0.56
Biotic index	4.3	4.1	4.4	4.0	4.2
% Filterer	10	40	31	53	34
Density	460	1413	906	799	895
EPT richness	20	22	22	20	21
Metals Tolerance index	3.3	4.4	4.4	4.3	4.1
Metric scores					
Taxa richness	6	6	6	5	6
Shannon diversity	6	6	6	6	6
EPT/EPTC	3	6	6	6	5
Hydropsychinae/Trichoptera	6	6	6	6	6
Baetidae/Ephemeroptera	6	4	6	6	6
Biotic index	5	5	5	5	5
% Filterer	6	6	6	5	6
Density (high)	*	6	6	6	6
Density (low)	5	6	6	6	6
EPT richness	5	6	6	5	6
Metals Tolerance index	6	5	5	5	5
Total	54	62	64	61	60
Organic subset	11	17	17	16	15
Metals subset	16	17	17	16	17
Bioassessment					
Overall	90%	94%	97%	92%	93%
Organic subset	92%	94%	94%	89%	92%
Metals subset	89%	94%	94%	89%	92%

* not calculated if density is < 550

C-11. Mean metric values and bioassessment scores for Clark Fork River at Gold Creek Bridge: Station 11 - August, 1986-1996 (4 Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	29	30	35	32	25	34	37	39	39	37	32	33
Shannon diversity	3.3	2.9	3.8	2.9	3.2	3.6	3.4	4.3	3.6	3.6	3.5	3.5
EPT/EPTC	0.87	0.83	0.80	0.93	0.93	0.86	0.63	0.79	0.75	0.73	0.86	0.82
Hydropsychinae/Trichoptera	0.76	0.79	0.93	0.23	0.90	0.56	0.54	0.58	0.83	0.90	0.82	0.71
Baetidae/Ephemeroptera	0.51	0.49	0.40	0.20	0.92	0.18	0.24	0.37	0.84	0.60	0.95	0.52
Biotic index	4.8	5.1	4.2	4.9	5.2	5.0	5.9	4.8	4.5	5.0	4.4	4.9
% Filterer	42	63	41	23	68	34	47	31	54	53	62	47
Density	838	1073	396	965	457	1446	1781	558	1265	906	509	927
EPT richness	15	17	18	18	13	19	17	21	24	19	19	18
Metals Tolerance index	4.8	5.3	4.4	4.6	5.5	5.1	5.5	4.6	4.5	5.0	4.5	4.9
Metric scores												
Taxa richness	3	4	5	4	3	4	4	5	5	5	4	4
Shannon diversity	5	4	6	4	5	6	6	6	6	6	6	5
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	6	6	3	6	4	6	6	6	6	4	6	5
Baetidae/Ephemeroptera	6	6	6	6	3	6	6	6	6	6	2	5
Biotic index	4	4	5	4	3	4	2	5	5	4	5	4
% Filterer	6	3	6	6	2	6	6	6	5	5	3	5
Density (high)	6	6	*	6	*	6	6	6	6	6	*	6
Density (low)	6	6	4	6	5	6	6	6	6	6	5	6
EPT richness	4	4	5	5	3	5	4	5	6	5	5	5
Metals Tolerance index	5	4	5	5	4	4	4	5	5	4	5	5
Total	57	53	51	58	38	59	56	62	62	57	47	56
Organic subset	16	13	11	16	5	16	14	17	16	15	8	15
Metals subset	15	14	14	16	12	15	14	16	17	15	15	15
Bioassessment												
Overall	86%	80%	85%	88%	63%	89%	85%	94%	94%	86%	78%	85%
Organic subset	89%	72%	92%	89%	42%	89%	78%	94%	89%	83%	67%	80%
Metals subset	83%	78%	78%	89%	67%	83%	78%	89%	94%	83%	83%	82%

* not calculated if density is < 550

**C-12. Mean metric values and bioassessment scores for Flint Creek at New Chicago:
Station 11.5 - August, 1993-1996 (four Hess samples per year).**

	1993	1994	1995	1996	Mean
Metric values					
Taxa richness	30	34	35	39	34
Shannon diversity	1.7	3.1	3.8	3.3	2.9
EPT/EPTC	0.92	0.88	0.71	0.87	0.85
Hydropsychinae/Trichoptera	0.05	0.71	0.50	0.86	0.53
Baetidae/Ephemeroptera	0.38	0.86	0.69	0.81	0.69
Biotic index	3.1	4.3	4.2	4.5	4.0
% Filterer	78	68	52	74	68
Density	1137	1665	1501	1731	1509
EPT richness	14	18	19	22	18
Metals Tolerance index	3.1	4.8	4.5	4.5	4.2
Metric scores					
Taxa richness	4	4	5	5	5
Shannon diversity	1	5	6	5	4
EPT/EPTC	6	6	6	6	6
Hydropsychinae/Trichoptera	6	6	6	5	6
Baetidae/Ephemeroptera	6	5	6	6	6
Biotic index	6	5	5	5	5
% Filterer	0	2	5	1	2
Density (high)	6	6	6	6	6
Density (low)	6	6	6	6	6
EPT richness	4	5	5	6	5
Metals Tolerance index	6	5	5	5	5
Total	51	55	61	56	56
Organic subset	12	13	16	12	13
Metals subset	16	16	16	17	16
Bioassessment					
Overall	77%	83%	92%	85%	84%
Organic subset	67%	72%	89%	67%	74%
Metals subset	89%	89%	89%	94%	90%

C-13. Mean metric values and bioassessment scores for Clark Fork River at Bearmouth: Station 11.7 - August, 1993-1996 (4 Hess samples per year).

	1993	1994	1995	1996	Mean
Metric values					
Taxa richness	44	39	35	31	37
Shannon diversity	3.7	2.9	2.6	2.9	3.0
EPT/EPTC	0.74	0.72	0.87	0.86	0.80
Hydropsychinae/Trichoptera	0.51	0.98	0.97	0.92	0.85
Baetidae/Ephemeroptera	0.18	0.92	0.74	0.96	0.70
Biotic index	5.1	5.2	5.0	4.8	5.0
% Filterer	14	61	74	69	55
Density	1808	3675	1809	1690	2246
EPT richness	20	22	19	17	20
Metals Tolerance index	4.7	5.0	5.0	4.9	4.9
Metric scores					
Taxa richness	6	5	5	4	5
Shannon diversity	6	4	4	4	5
EPT/EPTC	6	6	6	6	6
Hydropsychinae/Trichoptera	6	1	1	3	3
Baetidae/Ephemeroptera	6	3	6	2	4
Biotic index	4	3	4	4	4
% Filterer	6	3	1	2	3
Density (high)	6	3	6	6	5
Density (low)	6	6	6	6	6
EPT richness	5	6	5	4	5
Metals Tolerance index	5	4	4	5	5
Total	62	44	48	46	50
Organic subset	16	9	11	12	12
Metals subset	16	16	15	15	16
Bioassessment					
Overall	94%	67%	73%	70%	76%
Organic subset	89%	50%	61%	67%	67%
Metals subset	89%	89%	83%	83%	86%

C-14. Mean metric values and bioassessment scores for Clark Fork River at Bonita: Station 12 - August, 1986-1996 (4 Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	26	34	31	29	23	37	34	34	30	34	31	31
Shannon diversity	2.2	3.1	2.4	3.0	2.3	2.2	2.5	3.4	2.9	2.8	2.8	2.7
EPT/EPTC	0.95	0.64	0.76	0.83	0.91	0.91	0.85	0.84	0.80	0.87	0.82	0.83
Hydropsychinae/Trichopter	0.97	0.96	0.99	0.83	0.95	0.95	0.98	0.73	0.93	0.95	0.94	0.93
Baetidae/Ephemeroptera	0.94	0.48	0.90	0.88	0.92	0.91	0.98	0.17	0.87	0.69	0.96	0.79
Biotic index	4.7	5.1	4.7	5.2	5.0	5.0	5.2	4.7	4.8	4.8	4.9	4.9
% Filterer	63	52	69	60	72	74	67	33	64	68	65	62
Density	949	1228	8080	2227	1245	3153	3559	701	1926	1127	1338	2321
EPT richness	13	16	15	15	13	17	15	17	16	17	16	15
Metals Tolerance index	4.7	4.9	5.0	5.1	5.1	5.2	5.1	4.5	4.9	4.8	4.9	4.9
Metric scores												
Taxa richness	3	4	4	3	2	5	4	4	4	4	4	4
Shannon diversity	3	5	3	5	3	3	3	6	4	4	4	4
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichopter	1	2	1	6	2	2	1	6	3	2	2	3
Baetidae/Ephemeroptera	2	6	4	4	3	3	1	6	5	6	2	4
Biotic index	4	4	4	3	4	4	3	4	4	4	4	4
% Filterer	3	5	2	4	1	1	2	6	3	2	3	3
Density (high)	6	6	0	5	6	4	3	6	6	6	6	5
Density (low)	6	6	6	6	6	6	6	6	6	6	6	6
EPT richness	3	4	4	4	3	4	4	4	4	4	4	4
Metals Tolerance index	5	5	4	4	4	4	4	5	5	5	5	5
Total	42	53	38	50	40	42	37	59	50	49	46	46
Organic subset	13	15	6	12	11	9	8	16	13	12	13	12
Metals subset	14	15	14	14	13	14	14	15	15	15	15	14
Bioassessment												
Overall	64%	80%	58%	76%	61%	64%	56%	89%	76%	74%	70%	70%
Organic subset	72%	83%	33%	67%	61%	50%	44%	89%	72%	67%	72%	65%
Metals subset	78%	83%	78%	78%	72%	78%	78%	83%	83%	83%	83%	80%

**C-15. Mean metric values and bioassessment scores for Rock Creek near Clinton:
Station 12.5 - August, 1993-1996 (4 Hess samples per year).**

	1993	1994	1995	1996	Mean
Metric values					
Taxa richness	36	35	37	36	36
Shannon diversity	3.0	3.8	4.0	4.0	3.7
EPT/EPTC	0.28	0.48	0.60	0.63	0.50
Hydropsychinae/Trichoptera	0.18	0.54	0.27	0.35	0.34
Baetidae/Ephemeroptera	0.26	0.26	0.34	0.34	0.30
Biotic index	3.8	3.6	3.6	3.6	3.7
% Filterer	10	17	20	29	19
Density	724	504	375	514	529
EPT richness	20	20	21	21	20
Metals Tolerance index	2.4	2.7	3.0	3.1	2.8
Metric scores					
Taxa richness	5	5	5	5	5
Shannon diversity	5	6	6	6	6
EPT/EPTC	3	5	6	6	5
Hydropsychinae/Trichoptera	6	6	6	6	6
Baetidae/Ephemeroptera	6	6	6	6	6
Biotic index	6	6	6	6	6
% Filterer	6	6	6	6	6
Density (high)	6	*	*	*	6
Density (low)	6	5	4	5	5
EPT richness	5	5	5	5	5
Metals Tolerance index	6	6	6	6	6
Total	60	56	56	57	57
Organic subset	18	12	12	12	14
Metals subset	17	16	15	16	16
Bioassessment					
Overall	91%	93%	93%	95%	93%
Organic subset	100%	100%	100%	100%	100%
Metals subset	94%	89%	83%	89%	89%

* not calculated if density is < 550

**C-16. Mean metric values and bioassessment scores for Clark Fork River at Turah:
Station 13 - August, 1986-1996 (4 Hess samples per year).**

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	34	35	42	31	31	50	49	46	38	44	40	40
Shannon diversity	3.7	3.3	3.1	3.7	3.6	4.1	3.5	4.4	3.5	4.0	3.9	3.7
EPT/EPTC	0.63	0.81	0.80	0.77	0.61	0.63	0.72	0.76	0.73	0.68	0.80	0.72
Hydropsychinae/Trichoptera	0.81	0.92	0.96	0.85	0.54	0.75	0.93	0.85	0.89	0.70	0.81	0.82
Baetidae/Ephemeroptera	0.40	0.68	0.83	0.48	0.22	0.40	0.87	0.34	0.59	0.53	0.55	0.54
Biotic index	4.8	4.7	4.4	4.7	5.1	5.0	4.8	4.0	4.3	4.9	4.3	4.6
% Filterer	44	68	65	50	27	34	56	22	51	44	57	47
Density	1539	1708	5636	1725	2145	2164	2757	483	1078	1941	1354	2048
EPT richness	17	19	23	17	16	26	26	26	20	25	23	22
Metals Tolerance index	5.0	4.8	4.8	4.6	5.3	5.1	4.7	3.5	4.2	5.2	4.2	4.7
Metric scores												
Taxa richness	4	5	6	4	4	6	6	6	5	6	6	5
Shannon diversity	6	5	5	6	6	6	6	6	6	6	6	6
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	6	3	2	5	6	6	3	5	4	6	6	5
Baetidae/Ephemeroptera	6	6	6	6	6	6	5	6	6	6	6	6
Biotic index	4	4	5	4	4	4	4	5	5	4	5	4
% Filterer	6	2	3	6	6	6	4	6	5	6	4	5
Density (high)	6	6	0	6	5	5	4	*	6	6	6	5
Density (low)	6	6	6	6	6	6	6	5	6	6	6	6
EPT richness	4	5	6	4	4	6	6	6	5	6	6	5
Metals Tolerance index	4	5	5	5	4	4	5	6	5	4	5	5
Total	58	53	50	58	57	61	55	57	59	62	62	57
Organic subset	16	12	8	16	15	15	12	11	16	16	15	14
Metals subset	14	16	17	15	14	16	17	17	16	16	17	16
Bioassessment												
Overall	88%	80%	76%	88%	86%	92%	83%	95%	89%	94%	94%	88%
Organic subset	89%	67%	44%	89%	83%	83%	67%	92%	89%	89%	83%	80%
Metals subset	78%	89%	94%	83%	78%	89%	94%	94%	89%	89%	94%	88%

* not calculated if <550

**C-17. Mean metric values and bioassessment scores for Blackfoot River at USGS:
Station 14 - August, 1986-1996 (4 Hess samples per year).**

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	21	31	36	28	31	30	41	37	39	42	35	34
Shannon diversity	4.0	3.3	4.0	4.0	4.1	4.1	2.8	3.9	4.0	3.6	3.9	3.8
EPT/EPTC	0.76	0.37	0.59	0.77	0.88	0.88	0.20	0.50	0.68	0.54	0.91	0.64
Hydropsychinae/Trichoptera	0.62	0.84	0.73	0.79	0.74	0.65	0.77	0.64	0.78	0.64	0.74	0.72
Baetidae/Ephemeroptera	0.49	0.49	0.71	0.37	0.28	0.47	0.50	0.41	0.44	0.35	0.75	0.48
Biotic index	3.4	4.8	4.8	3.7	3.5	3.6	4.4	4.1	4.0	3.7	3.7	4.0
% Filterer	19	17	32	42	45	30	7	19	37	26	55	30
Density	65	414	382	192	408	170	975	284	511	535	426	397
EPT richness	14	18	20	17	20	20	23	22	22	24	21	20
Metals Tolerance index	3.0	2.9	3.8	3.4	3.6	3.7	2.9	3.7	3.7	2.6	3.8	3.4
Metric scores												
Taxa richness	2	4	5	3	4	4	6	5	5	6	5	4
Shannon diversity	6	5	6	6	6	6	4	6	6	6	6	6
EPT/EPTC	6	4	6	6	6	6	2	5	6	5	6	5
Hydropsychinae/Trichoptera	6	6	6	6	6	6	6	6	6	6	6	6
Baetidae/Ephemeroptera	6	6	6	6	6	6	6	6	6	6	6	6
Biotic index	6	4	4	6	6	6	5	5	5	6	6	5
% Filterer	6	6	6	6	6	6	6	6	6	6	5	6
Density (high)	*	*	*	*	*	*	6	*	*	*	*	6
Density (low)	1	4	4	2	4	2	6	3	5	5	4	4
EPT richness	4	5	5	4	5	5	6	6	6	6	5	5
Metals Tolerance index	6	6	6	6	6	6	6	6	6	6	6	6
Total	49	50	54	51	55	53	59	54	57	58	55	54
Organic subset	12	10	10	12	12	12	17	11	11	12	11	12
Metals subset	11	15	15	12	15	13	18	15	17	17	15	15
Bioassessment												
Overall	82%	83%	90%	85%	92%	88%	89%	90%	95%	97%	92%	89%
Organic subset	100%	83%	83%	100%	100%	100%	94%	92%	92%	100%	92%	94%
Metals subset	61%	83%	83%	67%	83%	72%	100%	83%	94%	94%	83%	82%

* not calculated if density is < 550

C-18. Mean metric values and bioassessment scores for Clark Fork River above Missoula: Station 15.5 - August, 1989-1996 (4 Hess samples per year).

	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values									
Taxa richness	29	25	32	39	36	37	47	38	35
Shannon diversity	3.4	2.8	3.2	3.7	4.0	3.5	3.5	3.6	3.5
EPT/EPTC	0.84	0.91	0.83	0.65	0.85	0.76	0.88	0.92	0.83
Hydropsychinae/Trichoptera	0.86	0.92	0.94	0.89	0.90	0.97	0.95	0.93	0.92
Baetidae/Ephemeroptera	0.71	0.51	0.82	0.96	0.30	0.66	0.40	0.57	0.62
Biotic index	4.3	4.1	4.5	5.0	3.8	4.6	4.3	4.3	4.4
% Filterer	67	79	64	53	48	58	67	66	63
Density	341	468	560	1841	384	1292	2090	795	971
EPT richness	18	16	16	21	21	20	27	23	20
Metals Tolerance index	4.3	4.0	4.6	5.2	3.4	4.7	4.3	4.3	4.4
Metric scores									
Taxa richness	3	3	4	5	5	5	6	5	5
Shannon diversity	6	4	5	6	6	6	6	6	6
EPT/EPTC	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	5	3	2	4	4	1	2	3	3
Baetidae/Ephemeroptera	6	6	6	2	6	6	6	6	6
Biotic index	5	5	5	4	6	4	5	5	5
% Filterer	2	0	3	5	6	4	2	2	3
Density (high)	*	*	6	6	*	6	5	6	6
Density (low)	3	5	6	6	4	6	6	6	5
EPT richness	5	4	4	5	5	5	6	6	5
Metals Tolerance index	5	5	5	4	6	5	5	5	5
Total	46	41	52	53	54	54	55	56	54
Organic subset	7	5	14	15	12	14	12	13	14
Metals subset	13	14	15	15	15	16	17	17	15
Bioassessment									
Overall	77%	68%	79%	80%	90%	82%	83%	85%	81%
Organic subset	58%	42%	78%	83%	100%	78%	67%	72%	72%
Metals subset	72%	78%	83%	83%	83%	89%	94%	94%	85%

* not calculated if density is < 550

C-19. Mean metric values and bioassessment scores for Clark Fork River at Shuffields: Station 18 - August, 1986-1996 (4 Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	29	38	34	27	30	34	38	45	39	42	39	36
Shannon diversity	2.9	4.0	3.2	3.5	3.5	3.6	2.9	4.0	3.1	3.8	3.6	3.5
EPT/EPTC	0.90	0.79	0.90	0.82	0.86	0.75	0.91	0.70	0.84	0.60	0.90	0.82
Hydropsychinae/Trichoptera	0.96	0.75	0.71	0.92	0.73	0.81	0.83	0.73	0.92	0.81	0.85	0.82
Baetidae/Ephemeroptera	0.80	0.93	0.72	0.50	0.67	0.53	0.67	0.59	0.60	0.77	0.66	0.68
Biotic index	4.3	4.8	4.1	4.5	4.3	4.5	4.7	4.6	4.8	5.1	4.2	4.5
% Filterer	73	43	48	63	67	54	72	24	73	35	71	57
Density	584	1052	1360	830	932	627	1543	848	1725	1992	706	1109
EPT richness	16	20	18	16	19	19	22	22	22	22	25	20
Metals Tolerance index	4.2	4.6	4.7	4.5	4.2	4.7	4.4	4.6	4.7	5.3	4.1	4.5
Metric scores												
Taxa richness	3	5	4	3	4	4	5	6	5	6	5	5
Shannon diversity	4	6	5	6	6	6	4	6	5	6	6	5
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	2	6	6	3	6	6	6	6	3	6	5	5
Baetidae/Ephemeroptera	6	3	6	6	6	6	6	6	6	6	6	6
Biotic index	5	4	5	5	5	5	4	4	4	4	5	5
% Filterer	1	6	6	3	2	5	1	6	1	6	1	3
Density (high)	6	6	6	6	6	6	6	6	6	6	6	6
Density (low)	6	6	6	6	6	6	6	6	6	6	6	6
EPT richness	4	5	5	4	5	5	6	6	6	6	6	5
Metals Tolerance index	5	5	5	5	5	5	5	5	5	4	5	5
Total	48	58	60	53	57	60	55	63	53	62	57	57
Organic subset	12	16	17	14	13	16	11	16	11	16	12	14
Metals subset	15	16	16	15	16	16	17	17	17	16	17	16
Bioassessment												
Overall	73%	88%	91%	80%	86%	91%	83%	95%	80%	94%	86%	86%
Organic subset	67%	89%	94%	78%	72%	89%	61%	89%	61%	89%	67%	78%
Metals subset	83%	89%	89%	83%	89%	89%	94%	94%	94%	89%	94%	90%

C-20. Mean metric values and bioassessment scores for Bitterroot River near mouth: Station 19 - August, 1986-1996 (4 Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	31	35	39	33	30	36	34	37	29	41	34	34
Shannon diversity	3.5	3.7	3.4	3.8	3.5	3.8	3.1	4.3	2.9	3.9	3.3	3.6
EPT/EPTC	0.83	0.77	0.81	0.80	0.91	0.72	0.68	0.73	0.78	0.81	0.91	0.80
Hydropsychinae/Trichoptera	0.96	0.91	0.96	0.73	0.83	0.89	0.92	0.73	0.90	0.68	0.82	0.85
Baetidae/Ephemeroptera	0.65	0.55	0.84	0.35	0.48	0.34	0.63	0.18	0.55	0.08	0.69	0.49
Biotic index	4.7	4.8	4.6	4.2	4.4	4.6	4.9	4.0	4.7	4.0	4.3	4.5
% Filterer	65	63	63	58	66	56	69	35	81	45	70	61
Density	890	1085	1243	792	936	810	1421	334	1870	938	1055	1034
EPT richness	16	20	21	19	17	18	18	21	14	22	18	18
Metals Tolerance index	4.7	4.4	4.8	3.8	4.4	4.9	4.7	3.1	4.6	3.9	4.4	4.3
Metric scores												
Taxa richness	4	5	5	4	4	5	4	5	3	6	4	4
Shannon diversity	6	6	6	6	6	6	5	6	4	6	5	6
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	2	3	2	6	6	4	3	6	4	6	6	4
Baetidae/Ephemeroptera	6	6	6	6	6	6	6	6	6	6	6	6
Biotic index	4	4	4	5	5	4	4	5	4	5	5	4
% Filterer	3	3	3	4	2	4	2	6	0	6	2	3
Density (high)	6	6	6	6	6	6	6	*	6	6	6	6
Density (low)	6	6	6	6	6	6	6	3	6	6	6	6
EPT richness	4	5	5	5	4	5	5	5	4	6	5	5
Metals Tolerance index	5	5	5	6	5	5	5	6	5	6	5	5
Total	52	55	54	60	56	57	52	54	48	65	56	56
Organic subset	13	13	13	15	13	14	12	11	10	17	13	14
Metals subset	15	16	16	17	15	16	16	14	15	18	16	16
Bioassessment												
Overall	79%	83%	82%	91%	85%	86%	79%	90%	73%	98%	85%	85%
Organic subset	72%	72%	72%	83%	72%	78%	67%	92%	56%	94%	72%	76%
Metals subset	83%	89%	89%	94%	83%	89%	89%	78%	83%	100%	89%	88%

* not calculated if < 550

C-21. Mean metric values and bioassessment scores for Clark Fork River at Harper Bridge: Station 20, August, 1986-1996 (4 Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	28	33	31	29	28	32	39	31	31	41	33	32
Shannon diversity	2.9	3.2	2.5	3.5	3.1	3.3	3.2	1.4	3.2	3.1	2.9	2.9
EPT/EPTC	0.92	0.76	0.84	0.59	0.74	0.78	0.53	0.81	0.77	0.78	0.90	0.77
Hydropsychinae/Trichoptera	0.95	0.92	0.98	0.93	0.96	0.93	0.93	0.98	0.90	0.91	0.93	0.94
Baetidae/Ephemeroptera	0.86	0.84	0.85	0.66	0.72	0.62	0.83	0.75	0.68	0.43	0.77	0.73
Biotic index	4.7	4.9	4.5	5.4	5.2	4.7	5.4	4.9	4.7	4.9	4.6	4.9
% Filterer	68	68	74	52	64	61	47	90	67	63	71	66
Density	810	1519	4786	1391	1362	795	4369	4259	1658	2436	882	2206
EPT richness	16	15	16	15	15	16	19	18	16	20	18	17
Metals Tolerance index	4.7	4.8	5.1	5.5	5.1	4.7	5.7	4.9	4.4	4.8	4.7	4.9
Metric scores												
Taxa richness	3	4	4	3	3	4	5	4	4	6	4	4
Shannon diversity	4	5	3	6	5	5	5	1	5	5	4	4
EPT/EPTC	6	6	6	6	6	6	5	6	6	6	6	6
Hydropsychinae/Trichoptera	2	3	1	3	2	3	3	1	4	3	3	3
Baetidae/Ephemeroptera	5	6	5	6	6	6	6	6	6	6	6	6
Biotic index	4	4	5	3	3	4	3	4	4	4	4	4
% Filterer	2	2	1	5	3	3	6	0	2	3	1	3
Density (high)	6	6	1	6	6	6	2	2	6	5	6	5
Density (low)	6	6	6	6	6	6	6	6	6	6	6	6
EPT richness	4	4	4	4	4	4	5	5	4	5	5	4
Metals Tolerance index	5	5	4	4	4	5	4	5	5	5	5	5
Total	47	51	40	52	48	52	50	40	52	54	50	49
Organic subset	12	12	7	14	12	13	11	6	12	12	11	11
Metals subset	15	15	14	14	14	15	15	16	15	16	16	15
Bioassessment												
Overall	71%	77%	61%	79%	73%	79%	76%	61%	79%	82%	76%	74%
Organic subset	67%	67%	39%	78%	67%	72%	61%	33%	67%	67%	61%	62%
Metals subset	83%	83%	78%	78%	78%	83%	83%	89%	83%	89%	89%	83%

C-22. Mean metric values and bioassessment scores for Clark Fork River at Huson: Station 22 - August, 1986-1996 (four Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	28	42	33	32	30	33	40	32	29	31	27	32
Shannon diversity	2.5	3.4	2.8	3.9	3.7	2.7	3.3	3.0	2.5	2.9	3.4	3.1
EPT/EPTC	0.94	0.79	0.82	0.63	0.70	0.83	0.50	0.73	0.70	0.68	0.82	0.74
Hydropsychinae/Trichoptera	0.99	0.93	0.97	0.86	0.79	0.99	0.94	0.66	0.81	0.86	0.95	0.89
Baetidae/Ephemeroptera	0.94	0.40	0.81	0.45	0.29	0.78	0.87	0.47	0.59	0.47	0.70	0.62
Biotic index	4.8	4.9	4.6	4.9	4.3	4.8	5.3	4.6	4.6	4.7	4.8	4.8
% Filterer	75	60	71	43	40	71	57	57	77	70	58	62
Density	1396	1452	2680	819	516	882	2902	806	4296	1205	476	1585
EPT richness	16	21	17	18	17	17	20	15	15	15	16	17
Metals Tolerance index	4.9	4.9	4.9	4.5	4.0	4.9	5.0	4.3	4.5	4.7	4.7	4.7
Metric scores												
Taxa richness	3	6	4	4	4	4	6	4	3	4	3	4
Shannon diversity	3	6	4	6	6	4	5	5	3	4	6	5
EPT/EPTC	6	6	6	6	6	6	5	6	6	6	6	6
Hydropsychinae/Trichoptera	1	3	1	5	6	1	2	6	6	5	2	3
Baetidae/Ephemeroptera	2	6	6	6	6	6	5	6	6	6	6	6
Biotic index	4	4	4	4	5	4	3	4	4	4	4	4
% Filterer	1	4	1	6	6	1	4	4	0	2	4	3
Density (high)	6	6	4	6	*	6	4	6	2	6	*	5
Density (low)	6	6	6	6	5	6	6	6	6	6	5	6
EPT richness	4	5	4	5	4	4	5	4	4	4	4	4
Metals Tolerance index	5	5	5	5	5	5	4	5	5	5	5	5
Total	41	57	45	59	53	47	49	56	45	52	45	50
Organic subset	11	14	9	16	11	11	11	14	6	12	8	11
Metals subset	15	16	15	16	14	15	15	15	15	15	14	15
Bioassessment												
Overall	62%	86%	68%	89%	88%	71%	74%	85%	68%	79%	75%	77%
Organic subset	61%	78%	50%	89%	92%	61%	61%	78%	33%	67%	67%	67%
Metals subset	83%	89%	83%	89%	78%	83%	83%	83%	83%	78%	83%	83%

* not calculated if density is < 550

C-23. Mean metric values and bioassessment scores for Clark Fork River near Superior: Station 24 - August, 1986-1996 (four Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	31	34	36	28	33	33	44	34	28	35	28	33
Shannon diversity	3.5	3.5	3.3	2.8	3.8	3.8	3.7	3.9	3.1	3.3	2.7	3.4
EPT/EPTC	0.84	0.76	0.80	0.84	0.81	0.83	0.70	0.65	0.82	0.83	0.94	0.80
Hydropsychinae/Trichoptera	0.73	0.96	0.97	0.91	0.86	0.90	0.90	0.86	0.93	0.77	0.91	0.88
Baetidae/Ephemeroptera	0.80	0.54	0.61	0.42	0.53	0.70	0.19	0.36	0.58	0.21	0.60	0.50
Biotic index	4.4	5.0	4.7	4.8	4.6	4.5	4.9	4.4	4.5	4.1	4.5	4.6
% Filterer	55	61	61	74	56	54	49	53	74	64	78	62
Density	537	1100	2738	1088	725	463	955	975	2084	1102	873	1149
EPT richness	18	17	20	17	22	19	26	18	16	20	15	19
Metals Tolerance index	3.9	4.6	4.4	4.7	4.4	4.7	4.6	4.0	4.5	3.9	4.6	4.4
Metric scores												
Taxa richness	4	4	5	3	4	4	6	4	3	5	3	4
Shannon diversity	6	6	5	4	6	6	6	6	5	5	4	5
EPT/EPTC	6	6	6	6	6	6	6	6	6	6	6	6
Hydropsychinae/Trichoptera	6	2	1	3	5	4	4	5	3	6	3	4
Baetidae/Ephemeroptera	6	6	6	6	6	6	6	6	6	6	6	6
Biotic index	5	4	4	4	4	5	4	5	5	5	5	5
% Filterer	5	3	3	1	4	5	6	5	1	3	0	3
Density (high)	*	6	4	6	6	*	6	6	5	6	6	6
Density (low)	5	6	6	6	6	5	6	6	6	6	6	6
EPT richness	5	4	5	4	6	5	6	5	4	5	4	5
Metals Tolerance index	6	5	5	5	5	5	5	6	5	6	5	5
Total	54	52	50	48	58	51	61	60	49	59	48	54
Organic subset	10	13	11	11	14	10	16	16	11	14	11	12
Metals subset	16	15	16	15	17	15	17	17	15	17	15	16
Bioassessment												
Overall	90%	79%	76%	73%	88%	85%	92%	91%	74%	89%	73%	83%
Organic subset	83%	72%	61%	61%	78%	83%	89%	89%	61%	78%	61%	74%
Metals subset	89%	83%	89%	83%	94%	83%	94%	94%	83%	94%	83%	88%

* not calculated if density is < 550

C-24. Mean metric values and bioassessment scores for Clark Fork River above the Flathead River: Station 25 - August, 1986-1996 (four Hess samples per year).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values												
Taxa richness	25	31	37	27	29	35	40	37	36	42	37	34
Shannon diversity	3.4	3.3	3.3	3.4	3.8	3.8	3.7	3.4	3.3	4.0	3.2	3.5
EPT/EPTC	0.79	0.66	0.66	0.61	0.58	0.71	0.64	0.55	0.46	0.70	0.66	0.64
Hydropsychinae/Trichoptera	0.70	0.90	0.96	0.98	0.91	0.96	0.91	0.95	0.91	0.76	0.95	0.90
Baetidae/Ephemeroptera	0.58	0.60	0.60	0.41	0.33	0.31	0.22	0.21	0.21	0.17	0.39	0.37
Biotic index	4.5	5.0	4.8	4.9	4.9	4.7	5.0	4.9	5.1	4.4	4.9	4.8
% Filterer	50	53	57	64	63	55	54	72	64	45	76	59
Density	249	1102	2097	1030	672	633	1355	684	1955	654	739	1015
EPT richness	14	15	20	15	17	16	20	19	18	23	20	18
Metals Tolerance index	3.7	3.9	3.9	4.3	3.8	4.6	4.7	3.1	3.3	3.2	3.5	3.8
Metric scores												
Taxa richness	3	4	5	3	3	5	6	5	5	6	5	5
Shannon diversity	6	5	5	6	6	6	6	6	5	6	5	6
EPT/EPTC	6	6	6	6	6	6	6	6	5	6	6	6
Hydropsychinae/Trichoptera	6	4	2	1	3	2	3	2	3	6	2	3
Baetidae/Ephemeroptera	6	6	6	6	6	6	6	6	6	6	6	6
Biotic index	5	4	4	4	4	4	4	4	4	5	4	4
% Filterer	6	5	4	3	3	5	5	1	3	6	0	4
Density (high)	*	6	5	6	6	6	6	6	6	6	6	6
Density (low)	2	6	6	6	6	6	6	6	6	6	6	6
EPT richness	4	4	5	4	4	4	5	5	5	6	5	5
Metals Tolerance index	6	6	6	5	6	5	5	6	6	6	6	6
Total	50	56	54	50	53	55	58	53	54	65	51	54
Organic subset	11	15	13	13	13	15	15	11	13	17	10	13
Metals subset	12	16	17	15	16	15	16	17	17	18	17	16
Bioassessment												
Overall	83%	85%	82%	76%	80%	83%	88%	80%	82%	98%	77%	83%
Organic subset	92%	83%	72%	72%	72%	83%	83%	61%	72%	94%	56%	77%
Metals subset	67%	89%	94%	83%	89%	83%	89%	94%	94%	100%	94%	89%

* not calculated if density is < 550

C-25. Mean metric values and bioassessment scores for Clark Fork River above Thompson Falls Reservoir: Station 27 - August, 1987-1995 (four Hess samples per year).

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Metric values											
Taxa richness	26	26	21	29	31	23	27	25	25	n	26
Shannon diversity	2.9	2.8	2.6	2.9	2.9	2.7	3.0	2.8	2.7	o	2.8
EPT/EPTC	0.79	0.91	0.58	0.83	0.87	0.79	0.51	0.93	0.86		0.79
Hydropsychinae/Trichoptera	0.96	0.94	0.98	0.91	0.93	0.98	0.88	0.83	0.83	q	0.92
Baetidae/Ephemeroptera	0.34	0.31	0.24	0.54	0.37	0.04	0.22	0.09	0.31	u	0.27
Biotic index	5.2	5.0	5.3	4.8	4.7	5.1	5.3	4.2	4.4	a	4.9
% Filterer	67	78	75	76	69	73	66	64	71	l	71
Density	525	851	838	520	486	627	313	463	287	i	546
EPT richness	12	12	9	17	18	9	11	13	12	t	13
Metals Tolerance index	4.9	4.5	4.2	4.2	5.1	3.9	2.8	4.0	4.0	a	4.2
										t	
										i	
Metric scores											
Taxa richness	3	3	2	3	4	2	3	3	3	e	3
Shannon diversity	4	4	4	4	4	4	5	4	4		4
EPT/EPTC	6	6	6	6	6	6	5	6	6	d	6
Hydropsychinae/Trichoptera	2	2	1	3	3	1	4	6	6	a	3
Baetidae/Ephemeroptera	6	6	6	6	6	6	6	6	6	t	6
Biotic index	3	4	3	4	4	4	3	5	5	a	4
% Filterer	2	0	1	0	2	1	2	3	1		1
Density (high)	*	6	6	*	*	6	*	*	*		6
Density (low)	5	6	6	5	5	6	3	5	3		5
EPT richness	3	3	2	4	5	2	3	3	3		3
Metals Tolerance index	5	5	5	5	4	6	6	6	6		5
Total	39	45	42	40	43	44	40	47	43		43
Organic subset	5	10	10	4	6	11	5	8	6		7
Metals subset	13	14	13	14	14	14	12	14	12		13
Bioassessment											
Overall	65%	68%	64%	67%	72%	67%	67%	78%	72%		69%
Organic subset	42%	56%	56%	33%	50%	61%	42%	67%	50%		51%
Metals subset	72%	78%	72%	78%	78%	78%	67%	78%	67%		74%

* not calculated if density is < 550

